BUILD UP SKILLS

ENERGY TRAINING FOR BUILDERS

BUILD UP Skills – Estonia

Analysis of the National Status Quo

September 2012

Project coordinator
Foundation KredEx

Project partners
Ministry of Economic Affairs and Communications
Estonian Association of Construction Entrepreneurs
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The report makes widespread use of the results of a study conducted by the Estonian Institute of Economic Research, "Workforce-related situation of Estonian construction companies and prospective need for workforce."
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Foundation KredEx is the coordinator for the consortium's mapping and recommendations for a roadmap; the recommendations and results emerging in the project will give expression to the full process and do not necessarily reflect the opinion of the Ministry of Economic Affairs and Communications of Estonia.

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Foreword

About 40% of all energy used in the European Union is related to buildings. Half of it could be saved using simple and effective measures. In Estonia, at least 30 per cent of energy could be saved by renovating apartment buildings built in the 20th century. To achieve the European Union's objectives for 2020 and to raise the competitiveness of the Estonian construction sector, education and training in the field of energy efficiency must be provided to master-level construction specialists and workers. The BuildEst project is being implemented in Estonia for this purpose. The project is part of the European Agency for Competitiveness and Innovation's (EACI) project Build Up Skills and the broader goal is to ensure more energy efficient functioning of the construction sector to save 20% energy by 2020.

This analysis is the first output of the project, and its goal is to give an overview of how the Estonian construction sector developed and of what it is now, its legal and political background, the education system (vocational, higher and adult education) and to describe the workforce's needs for training and qualifications. It lists possible obstacles found during the analysis, which are related to qualification of employee in the construction sector and which may have the most influence on the achievement of the "Estonia 2020" objectives in seeking energy efficiency.

The outcome of this research is an input for the next stage of the project, in the course of which a roadmap of in-service training and other training in the field of in Estonia will be prepared along with an action plan up to 2020. It will lay a basis for developing national in-service training, training programmes and qualification system in the construction sector, and these will be developed hand in hand with relevant associated groups as well as other participants in the construction market. The main goal of preparing the roadmap and action plan is to encourage national groups to offer training, to expand and update the existing qualification requirements and to raise the level of in-service training in the construction sector, taking into account the development trends in Europe in this field.

The BuildEst project is being implemented in Estonia by a five-member consortium with the participants being KredEx (project coordinator), the Ministry of Economic Affairs and Communications, the Tallinn University of Technology, the Estonian Association of Construction Entrepreneurs and Innove Foundation. The project also has a support group consisting of the Ministry of Education and Research, the Rakvere Smart House Competence Centre, the Qualifications Authority, the Union of Estonian Architects, the Estonian Association of Heating and Ventilation Engineers, State Real Estate Ltd, and the Estonian Union of Co-operative Housing Associations.

1. Primary findings of the report

The workforce study data signal an urgent shortage of workforce in the sector – close to one-half of companies (48%) said they needed an employee or more immediately. The forecasts for 2012-2020 compiled on the basis of the overall numbers of people employed at construction companies indicate that the average number of the employed is 42,000-47,000 workers per year. Forecasts made on various assumptions show that the number of employed by construction companies could rise to 45,000-50,000 people or more. For this reason, **the construction sector would need, starting already in 2012, at least 935-1,200 new skilled workers per year, which makes up close to 3% of the entire workforce.**

In recent years, there have been 900-1,000 graduates per year in the construction field in vocational educational institutions. Yet we must take into consideration that admissions are down in 2010-2011, and thus the number of graduates in 2013 may be as low as 800. On the basis of feedback from schools, 43 percent of graduates from vocational education find employment in their chosen speciality, and 15 percent of graduates go on to pursue further study. Of graduates in construction specialities in vocational educational institutions, 36 percent are not employed in their speciality or do not work for other reasons. **This fact may reduce the number of new hires to as low as 600, which is much lower than even the most conservative forecast for workforce needs in the sector.** Another important factor is pressure favouring the migration of workforce to neighbouring countries with a higher wage level; it is likely that it will continue at the current pace, as convergence of wage levels is not realistic in the near future. The result is an increasing critical deficit of specialized workforce in Estonian construction enterprises.

According to workforce study data, construction workers who lack professional training account for close to 50 percent of workers at construction companies. There is a danger that the construction sector will have a significant number of workers who lack the necessary know-how. This will in turn affect construction quality.

Depending on the size of the company, one employee with master-level competence[1] is required per 6-10 construction workers; this master level employee is of key importance to ensuring work quality, including energy efficiency. **The total number of construction workers at construction companies in the years ahead will be around 28,000. Based on this, the master-level training target group is 3,500 employees.**

In the development of competences aimed at energy efficiency, the complementing of occupational standards in the construction field is of key importance, as these are the basis for updating the content of national curricula in vocational education as well as designing in-service trainings.

In connection to the transition to an eight-level qualification framework, the occupational standards in the construction field are being updated. As the process is still ongoing, this is a good opportunity to determine the need to treat, at various qualification levels, competences related to the energy efficiency of buildings and to make proposals for updating the occupational standards. The point of departure here is to what degree the given competence (knowledge, skills, attitudes) in the specific occupational standard may influence the energy efficiency of the building or of the construction process. The higher qualifications, the more wide-ranging the energy efficiency-related competences will have to be.

[1] We consider master level competences to be the skills of supervising construction workers with lower qualifications and of conveying professional skills and knowledge, and the readiness to take responsibility for organization of work, use of materials and outcome of work.

2. Methods used

2.1. Basic presumptions

Gathering and processing data for the analysis was the shared task of all of the partners in the project ad it took place on the basis of the guidelines set by the project funding provider and the division of labour planned in the project application.

In drawing conclusions from the strategies and policies pertaining to buildings' energy efficiency, the valid legal acts were taken into account, to which information on planned legal acts was added. The analysis covered consultations with coordinators of different financing measures to evaluate the impact of the existing and planned investment grants on buildings' energy efficiency and the work volumes to be channelled into the construction sector.

Gathering and analysis of statistics on the construction sector took place as joint work carried out by the Estonian Association of Construction Entrepreneurs and the Tallinn University of Technology, work that also involved the other members of the project working group. The working group reviewed a large number of public databases and information from various sources. There were difficulties with assembling the data for comparable and reliable analysis. Specific queries were made based on the project's needs to public databases to ensure the quality of the content and sufficient reliability of the key indicators for energy efficiency.

To get a better overview of the needs for workforce, experts from the Estonian Institute of Economic Research (EKI) were involved. They undertook a study to determine the workforce situation and the need for workforce. The study was supposed to provide some idea of whether construction companies have enough information on energy efficiency and environmentally friendly construction and what training needs in the field are. The study sought answers to the following questions:

– What construction field specialists are in short supply among companies?

– How will the need for different construction specialists change in years ahead up to 2015?

– What measures do companies intend to use to resolve problems related to shortage of construction specialists?

– At what age do employees generally leave work at construction companies?

– Do companies have employees related to energy efficiency?

– Do companies have information on energy efficiency construction?

– Are companies interested in training employees on the topic of energy efficiency construction?[1]

The study method used was an online survey of construction companies held in April 2012. The survey was sent electronically to 200 companies, including 80 members of the Estonian Association of Construction Entrepreneurs. A total of 75 responses were received. The companies that responded employed a total of 3,124 employees, which was 15% of the total in the fields observed (not including construction of civil engineering works and technical utility systems) and 8% of the total number of construction companies' employees. The sales revenue of the respondents in 2010 was 687 million euros, which was 28% of total

[1] Description of methodology is an extract from the EKI's study report "Workforce-related situation of Estonian construction companies and prospective need for workforce" 2012, pp. 4–5.

construction revenue that year and 39% of the sector's sales revenue. The results are partially comparable to a study conducted in 2007 by the EIER on the same topic.[2]

The study provides forecasts with regard to the number of the employed in construction for 2012–2020. Various calculations were performed to compile the forecasts: the basis was the number of employed in construction in that period, the value added generated in construction, and the long-term averages of construction volumes. The forecasts made on various presumptions show that the number of employees may rise to 60,000-70,000 this decade and that it at construction companies it should grow to 45,000-50,000 or even more (see table 2.1)[3]. The forecast provides a basis for optimistic and conservative approaches to workforce needs in the construction sector.

Table 2.1. Number of forecasted employed in construction in 2012–2020 (thousands)

	2012	2013	2014	2015	2016	2017	2018	2019	2020
Employed in construction									
on the basis of numbers of the employed	54	55	56	57	58	59	60	60	60
on the basis of value added	56	58	59	61	62	64	66	68	70
on the basis of construction work volume	62	64	65	66	67	68	69	70	71
Employed in construction enterprises									
on the basis of numbers of the employed	42	43	43	44	45	46	47	47	47
on the basis of value added	43	44	45	47	48	49	50	51	53
on the basis of construction work volume	46	49	50	51	52	52	53	54	54

2.2. Methodology for analysis of the education system, formal education and in-service training opportunities

The treatment of the educational system in Chapter 6 provides a general overview of the education and training opportunities in the field of construction, focusing in detail on analysis of formal education and training opportunities on the worker level. The chapter lists statistical data regarding starting out in, participating in and graduating from formal education at least in the last five years so that trends in workforce training can be assessed. Data were gathered with support from the Ministry of Education and Research from extracts form the Estonian Education Information System, where the study activity in the field is very precisely mapped out with regard to study volumes, number of students and data on vocational school teachers and university teachers. The information in the project report on activities for raising the professional qualification of vocational teachers originates with the Innove Foundation.

The analysis of the content of study is simplified significantly by the national curriculum system in use in Estonian vocational education, as a result of which the study based on the professional standard takes place on uniform grounds at different vocational schools. It describes how curricula deal with topics related to energy efficiency and to what extent. Yet the information on treatment of energy efficiency in national

[2] Workforce-related situation of Estonian construction companies and prospective need for workforce. Estonian Institute of Economic Research, 2007.

[3] Ibid., 2012, p. 35.

curricula is sparse and genera. In further stages of the project, we hope in cooperation with vocational schools to describe in more detail the skills that learners are expected to acquire.

With regard to the professional system, worker and engineering professions were also studied; likewise, the upgrade in progress to the professional standards and bringing them into conformity with the eight-level qualification framework. It provides statistics on awarding qualifications, and highlights energy efficiency-related knowledge in existing and past occupational standards and makes proposals with regard to occupational standards to be updated. Compared to other countries, the Estonian construction sector's qualification system described considerably fewer qualifications, but this factor does not point to deficits in the qualification system, it signals a need for specialists conversant in competences in more than one speciality. In very narrow specialities (such as thermal insulation specialist), it is not possible to find fulltime work in Estonia. Thus the narrower specialities are generally part of the occupational standard competences (thermal insulation is, e.g., a subcompetence in both the mortarer and finishing master professions).

The chapter on the education system examines construction study and treatment of energy efficiency on the higher education level. Those who have acquired an academic higher education often find employment as construction managers, site managers or project managers, thus making up a significant share of the responsible workforce in the construction sector, and their level of knowledge has a major impact on the quality of construction work in regard to energy efficiency. Data on higher education were obtained through the Estonian Education Information System; educational institutions also sent in data to the report compilers.

In mapping trainings aimed at construction sector employees, data were gathered with regard to primary training providers. Trainings held at vocational educational institutions were documented in detail in the Estonian Education Information System (EEIS). From the EEIS, it was possible to obtain data on the target groups, topics, training volumes, participants and financiers of trainings held in recent years. The data submitted by higher educational institutions were gathered on the basis of school feedback. They are not as detailed as the data on vocational training yet they are informative enough with regard to target groups and volumes. The only information source regarding activities of private-sector training providers was a survey of the providers, as no central institution gathers such data. Information on the trainings volumes, target groups and topics in the past two years was obtained from the survey; private training providers were not willing to send data with regard to a longer period.

2.3. Methods for determining shortcomings and obstacles

Determining factors that hinder conveying of energy efficiency-related knowledge and development of professional skills was a constant process that is part of preparing the report. When compiling the chapters, shortcomings became evident in information sources, difficulties appeared in coordinating activity of and exchanging information between different organizations.

The obstacles and shortcomings were mapped in the course of compiling the report; these were analyzed more thoroughly at working group meetings and then described along with possible solution methods. The general indicators for construction sector and data from the education system were compared with the workforce analysis by the Estonian Institute of Economic Research. The comparison brought out the intensified workforce shortage among worker-level qualifications. Chapters 8 and 9 of the report were also discussed at a meeting of the project support group with representatives from the construction and education field.

3. Characterisation of the construction sector

3.1. History and general description of the Estonian construction sector

In 20 years, the economic environment of re-independent Estonia has changed beyond recognition. The same can be said about the construction sector, which started developing rapidly as soon as Estonia introduced its sovereign currency. A number of state-owned companies were privatized, and new privately owned construction companies were formed from the remnants of state-owned companies. The rapid growth of the sector was boosted by the proximity of Finland and the latter's openness to newly independent Estonia, which allowed much to be learned from colleagues there. Indeed, the primary quality standards and know-how were transposed from Finland. A key step in the history of the Estonian construction sector can be considered to be the closing of the Ministry of Construction. Due to its cumbersome structure and excessive bureaucracy, it was, if anything, a brake on development.

The years from 1998–2000 were the first true test for the construction sector. A number of construction companies were forced to wind up. Expenses were trimmed and activity was cut back as demand on the construction market dropped drastically. This was followed by a period of growth for the Estonian economy as a whole as well as in the construction sector. It culminated with the construction boom in 2007, when construction volumes reached an unprecedented level and the share of the sector in GDP accounted for 10.7 percent. Everywhere in the Estonian economy, success stories were being told. Along with economic growth, investments increased, wages grew and purchasing power of the population rose, increasing demand on the internal market as well. Loan interest rates at banks underwent a record drop, which in turn promoted investment growth even further. Residential construction also grew exponentially. Besides shopping centres, office and production buildings, private homes, row houses and apartment buildings were constructed everywhere. Development activity was in full swing.

This period was soon followed by years in which economic growth was replaced by the deepest crisis of the post-independence period, the seeds of which lay in the loan policies of banks and the resulting real estate bubble. Construction volumes dropped by nearly half compared to the peak period, many companies went bankrupt and unemployment in Estonia rose to unprecedented heights. Many construction companies had to close up shop. Whereas in summer 2007, 87,000 people were employed in the construction sector, by the first quarter of 2010, the number had fallen to 40,000. The dynamics of the number of companies and employees in the construction sector is dealt with in greater detail in chapter 5.

In spite of the difficulties and complicated times, some positive aspects can also be highlighted:

- thanks to the increased competition during the crisis, the construction sector is better organized and fly-by-night contractors have largely disappeared;
- the crisis brought out significant deficiencies in legal acts governing fair competition and enterprise;
- in the increased competitiveness of recent years, the competitiveness of Estonian construction contractors also increased, as attested to by the significant growth in export figures in the

construction sector. Whereas the share of export in years past in the construction sector has fluctuated between 3-5 percent, in the first half of 2011, it rose to 10 percent.

A major problem in the Estonian construction sector is the tax morality of companies and envelope pay – i.e., wages paid in cash and not declared to the tax authority – and this has not yet been brought under control due to insufficient supervision.

According to Estonian Tax and Customs Board data, in 2011 one in four construction companies – many of them small and microenterprises – were suspected of tax fraud:

– 1,518 companies were suspected of VAT fraud (estimated loss borne by the state – 12.9 million €);
– 1,737 companies were suspected of paying undeclared wages (estimated loss borne by the state – 9.7 million €).

In recent years, the situation has started improving. To reduce tax fraud and ensure fair competition, cooperation has been stepped up with the Tax and Customs Board, the Riigi Kinnisvara Aktsiaselts (State Real Estate Ltd) and professional organizations operating in the construction sector.

3.2. Role of the construction sector and its share of the economy

The construction sector accounted for 6.3 percent of Estonia's GDP in 2011, which compared to previous years is still quite low (the average for 2005–2011 is 8.3%). From 2004–2010, the average share of the construction sector in Finland's GDP was 6.9%. In Estonia, it should account for at least 7.5–8%, if we keep in mind the Soviet-era housing stock and the state of the infrastructure. Considering the needs for renovation and restoration, the growth in construction volumes should continue in the long-term as well.

Compared to the finance sector and the overall change in GDP (see graph 1) the economic activity picked up in the construction sector after a lag time. From the overview of Estonian GDP in 2006–2011 we see that the recession lasted until 2009, and in 2010 the economy started gradually growing, but the construction sector is still declining in relation to GDP.

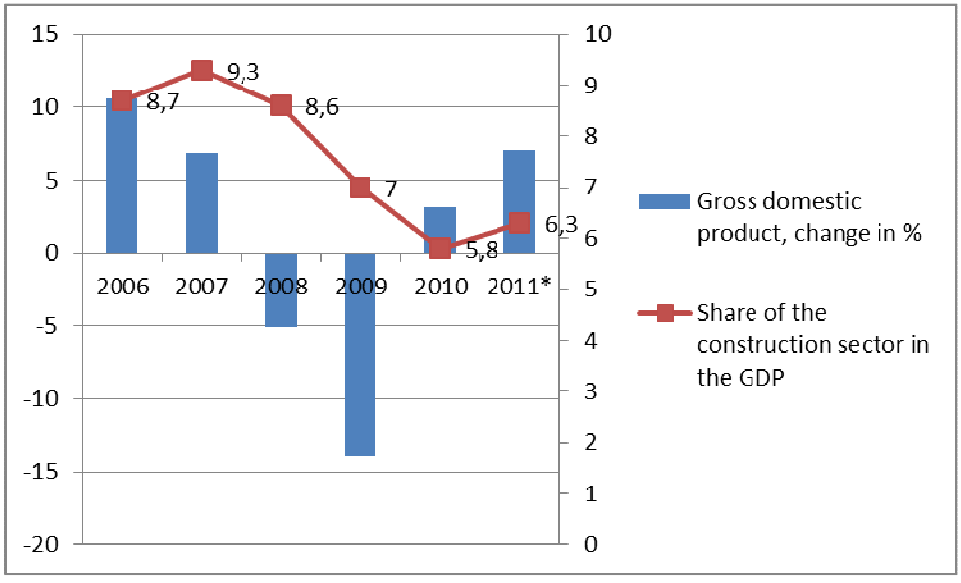


Figure 3.1. Estonian GDP and the share of the construction sector in 2006-2011 (%)

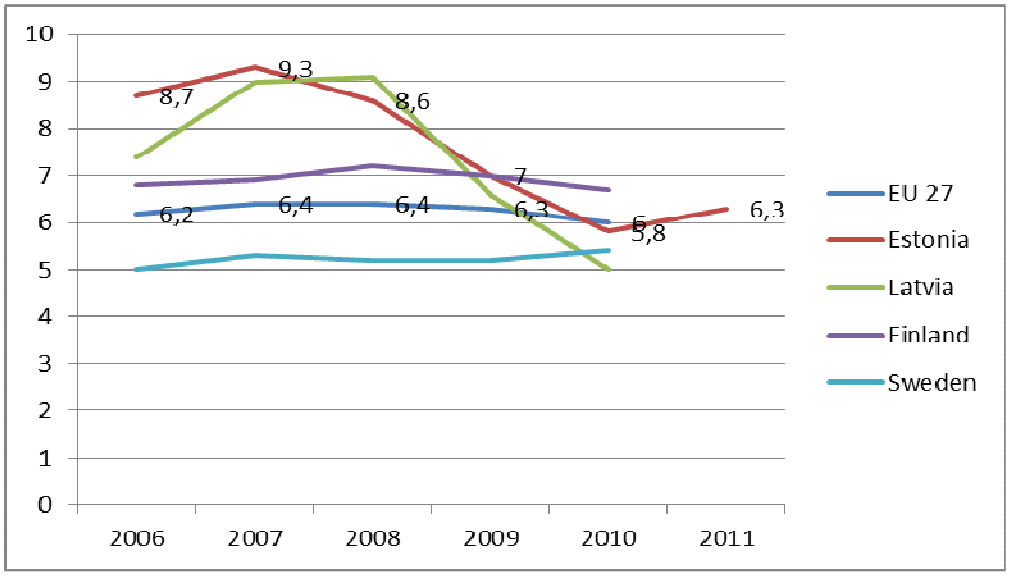
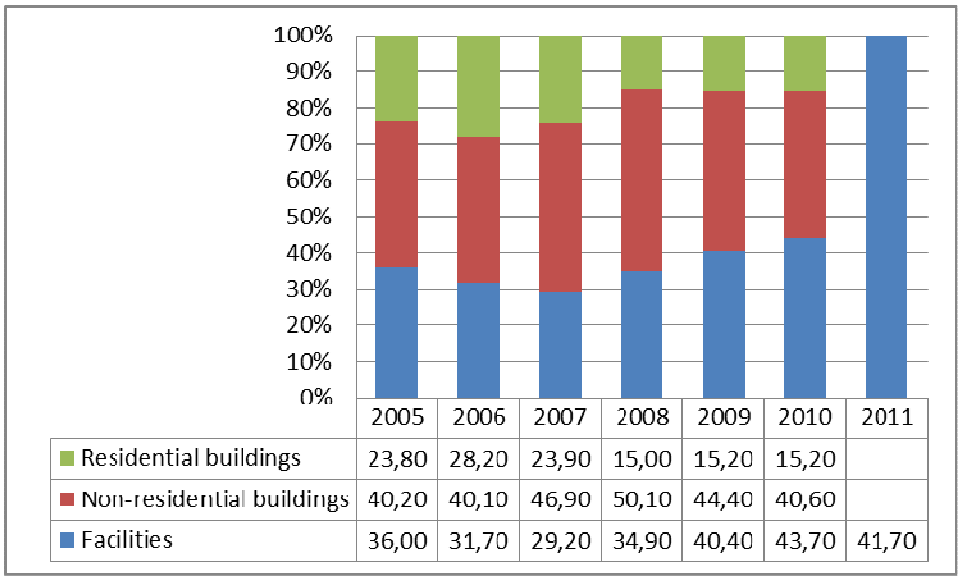


Figure 3.2. Share of the construction sector in value added (%)[1]

The share of the construction sector in value added generated in Estonia has been an average of 7.6 percent over the long term (1995-2010). In years more unfavourable to construction (such as in 1999-2001 and 2010) the indicator fell under 6 percent, while at the height of the boom it exceeded 9 percent. The indicator is mainly between 6-8 percent in conditions of balanced economic development. As a workforce-intensive field, the share of the construction sector is generally greater with respect to total employment than with respect to the GDP; for instance, accounting for 8.4 percent of employment in 2010.



	2005	2006	2007	2008	2009	2010	2011
Residential buildings	23,80	28,20	23,90	15,00	15,20	15,20	
Non-residential buildings	40,20	40,10	46,90	50,10	44,40	40,60	
Facilities	36,00	31,70	29,20	34,90	40,40	43,70	41,70

Figure 3.3. Distribution of the construction sector in 2005-2011 by type of building, %

[1] Eurostat http:/epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tec00005

3.3. Outlook for the construction sector in the coming years – main factors of change

In times of economic stability, private sector contracts are predominant in the construction market, while in an instable climate the public sector does most of the contracting. The share of government contracts is also influenced by the channelling of EU structural fund resources and extraordinary intergovernmental agreements, such as on carbon credits, into building construction and renovation.

According to Statistics Estonia and the Building Register, there is an average of around 30 m² of living space per capita in Estonia, which comes to a total housing space supply of approximately 40 million m². Based on a study by the Tallinn University of Technology, the average lifespan of residential buildings is 60 years. To maintain and preserve the existing housing, each year at least 1/60 of the existing space – 670,000 m² – should be constructed or renovated.

Even if we take into account the volumes of major renovation of residential buildings in recent years, the necessary level for renewing housing stock was only attained at the height of the construction boom in 2007-2008. In other years, the housing deficit has been growing with each year.

Considering the continuing increase in the housing fund deficit in Estonia and the European Union energy policy targets for 2020, we can project structural transformation in the construction sector. Changes in general regulatory acts, upgraded construction technologies and materials and changes in energy supply strategies condition new requirements for training and work-related organization of those operating in the construction sector.

Emigration of skilled workers to neighbouring countries with a higher standard of living has a significant impact on the Estonian construction workforce market. It will inevitably impinge on the quality of available labour and spending on the workforce. The Estonian construction sector essentially lacks foreign workforce from other countries; for instance compared to Scandinavia, Estonia does not have enough competitive clout to draw workforce from abroad. The influence of migration of the workforce is examined in more detail in chapter 5.

4. Strategies and action plans in connection with the objectives of "EU 2020"

For the purpose of more sustainable and environmentally friendly use of energy, the European Union (EU) is implementing an energy policy with a clearly greener trend. In order to raise awareness of energy efficiency, the EU has established many strategy documents and development plans that should, through the cohesion policy, reach the level of every member state.

The European strategies and plans have widely been greeted favourably, but due to their advisory nature, directives and regulations of the European Parliament and of the Council are implemented as well in order to incorporate energy-related objectives in the legal acts and policies of each member state. The process of attaining the lofty goals set for 2020 is accompanied by regular reporting to the European Commission. For instance, directives set out the obligation to report to the European Commission, via action plans, on the directions and implementation of energy efficiency measures.

The more resource-efficient and sustainable development of the EU requires a consistent and clear strategy and implementation of an action plan.

4.1. Strategies connected to the EU's energy objectives and directives; decisions and regulations of the European Parliament and of the Council

The most important documents related to EU energy policy up to 2020:

- "Europe 2020" – the EU strategy for smart and sustainable growth.[1]
- Climate and energy package.[2]
  - Directive 2009/31/EC of the European Parliament and of the Council on the geological storage of carbon dioxide;[3]
  - Decision no. 406/2009/EC of the European Parliament and of the Council on the effort of Member States to reduce their greenhouse gas emissions by 2020[4]
  - Regulation no. 443/2009 of the European Parliament and of the Council, setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce carbon dioxide emissions from light-duty vehicles.[5]
  - Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources;[6]

[1] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:2020:FIN:EN:PDF

[2] http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/628&format=HTML&aged=1&language=EN&guiLanguage=en

[3] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0114:0135:EN:PDF

[4] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0136:0148:EN:PDF

[5] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0001:0015:EN:PDF

[6] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:en:PDF

  - Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC.[7]
  - Directive 2009/29/EC of the European Parliament and of the Council amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community.[8]
- Directive 2002/91/EC of the European Parliament and of the Council on the energy performance of buildings.[9]
- Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast).[10]
- Directive 2005/32/EC of the European Parliament and of the Council establishing a framework for the setting of ecodesign requirements for energy-using products.[11]
- Directive 2006/32/EC of the European Parliament and of the Council on energy end-use efficiency and energy services.[12]

4.1.1. EU climate and energy package

The EU is working to achieve a global agreement on reduction of greenhouse emissions while serving as a role model for others with bold measures. With the decision adopted in 2008, the EU leaders approved a comprehensive package of measures for reducing emissions – the so-called **climate and energy package**.

As a result of the climate and energy package, the EU should be able to attain its **climate targets for 2020 (the so-called 20-20-20 targets):**

1. **Reducing energy consumption by 20%.**
2. **Reducing greenhouse gas emissions by 20% compared to the 1990 indicators;** 30% if the rest of the world joins the global climate agreement.
3. **Increasing the share of renewable energy in energy consumption by 20%**.
4. **Increasing the share of biofuels in EU transport fuels to 10 percent**.

4.1.2. Europe 2020: a strategy for smart, sustainable and inclusive economic growth

The Europe 2020 strategy has three priorities that support one another:

- smart economic growth: developing a knowledge- and innovation-based economy;
- sustainable economic growth: promoting more resource-effective, environmentally friendly and more competitive economy;

[7] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0088:0113:EN:PDF

[8] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0063:0087:en:PDF

[9] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX%3A32002L0091%3AEN%3AHTML

[10] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:153:0013:0035:EN:PDF

[11] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:191:0029:0029:EN:PDF

[12] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:114:0064:0064:EN:PDF

- inclusive economic growth: strengthening the economy with a high employment rate to ensure social and territorial cohesion.

The European Commission proposes that the following main objectives be established for the EU for 2020:

- 75% of the population aged 20–64 must be gainfully employed;
- 3% of the EU's GDP should be invested into research and development;
- **three climate and energy targets must be fulfilled (20%, 20%, 20%, including raising the emissions reduction threshold to 30% if appropriate conditions are met)**;
- the school dropout rate must remain under 10% and at least 40% of the new generation must acquire tertiary education;
- the number of people at risk for poverty to be reduced by 20 million.

These objectives are interconnected and are a surety for our general success. For each member state to shape the Europe 2020 strategy based on its concrete situation, the committee proposes to transpose the EU objectives into national objectives and plans.

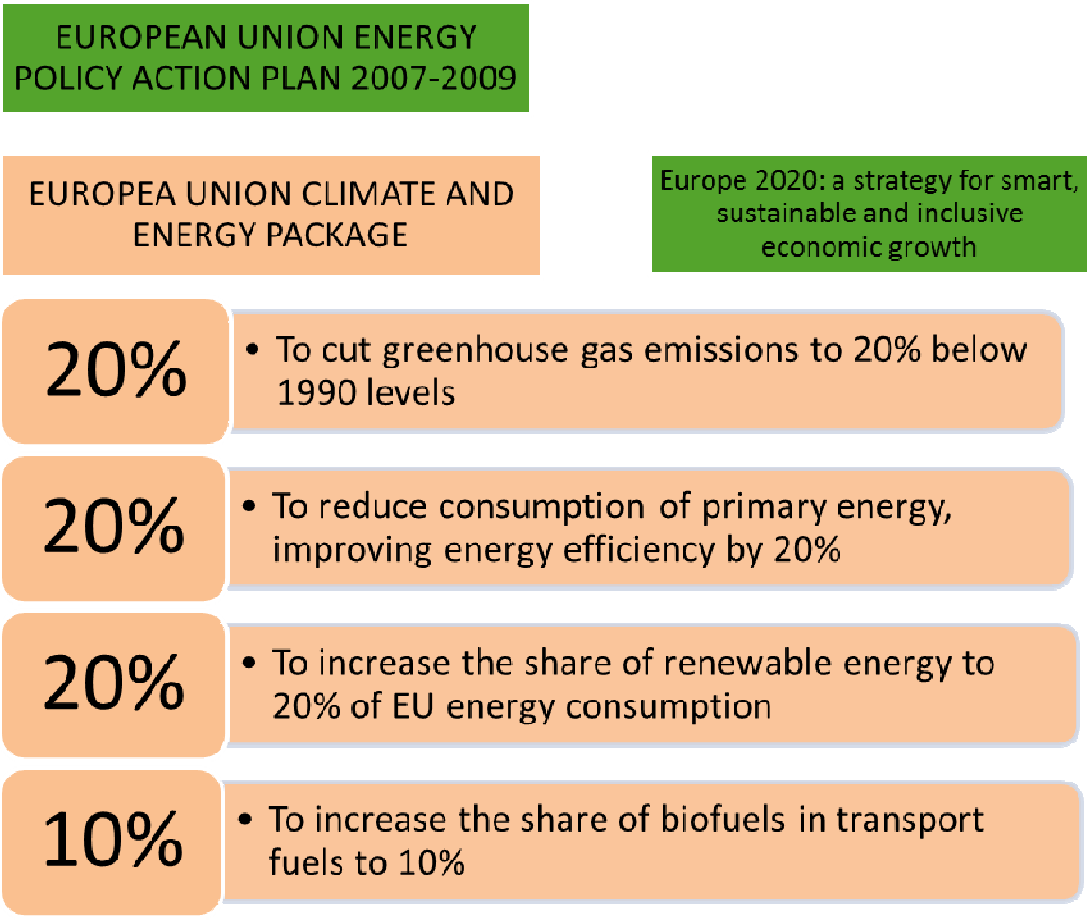


Figure 4.1. EU climate and energy targets

4.2. The Estonian government's horizontal strategic plans related to the energy sector

The national horizontal strategic plans establish a foundation and prerequisite for plans related to Estonian energy security.

- "Estonia 2020" competitiveness strategy.[13]
- National strategy for Estonia's sustainable development, "Sustainable Estonia 21"[14]

4.2.1. The "Estonia 2020" competitiveness strategy

The Estonia 2020 competitiveness strategy is Estonia's strategy for achieving the Europe 2020 objectives.

The plan describes the primary policy directions and measures to be implemented for the purpose of raising Estonia's competitiveness, sets goals for 2015 and 2020 in harmony with the objectives of the Europe 2020 strategy and challenges for Estonia, and lists the obligations to be assumed by Estonia in March 2011 in the framework of the Euro Plus Pact agreed upon by the European Council in March 2011.

The Europe 2020 strategy is a strategy for a new economic growth and employment in Europe and is a continuation of the Lisbon Strategy for Growth and Jobs. The primary goal is to increase European Union's competitiveness in a sustainable manner.

The Europe 2020 strategy has three priorities that support one another: knowledge and innovation (smart growth), a more sustainable economy (sustainable growth) and higher employment level and social inclusion (inclusive growth). The basic tenets of the Europe 2020 strategy were agreed on in June 2010 in the European Council, where the EU's measurable objectives for 2020 were approved as well.

One key principle that has been agreed upon is that the Europe 2020 strategy and its annual updates are to be submitted to the Commission along with stability and convergence programmes in April. The committee analyzes the economic policies of EU countries along with the medium-to-long-term budgetary framework objectives. Such an approach aids in the discussion of economic policies and fiscal policy objectives in both Estonia and at the EU level and vice versa.

The "Estonia 2020" action plan for 2011-2015

1. Continuing to diversify the energy source portfolio for preserving energy independence, including increasing the share of renewable energy sources and reducing the share of carbon-intensive energy sources. Amending the Estonian electricity development plan pursuant to developments in recent years.
2. Developing electrical connections with the Nordics and Baltics (implementing Estlink 2, strengthening the electrical connection with Latvia).
3. Liberalizing the natural gas market through divestment of property in harmony with the results of the analysis and forecast of the sustainability of natural gas as a domestic and regional fuel.

[13] http://valitsus.ee/UserFiles/valitsus/et/riigikantselei/strateegia/_b_konkurentsivoime-kava_b_/_b_eesti-2020-strateegia/Konkurentsiv%C3%B5ime%20kava%20Eesti%202020.pdf

[14] http://www.envir.ee/orb.aw/class=file/action=preview/id=90658/SE21_est_web.pdf

4. Continuing the renewable energy subsidy scheme. To optimize the levels of subsidization of renewable energy, an impact analysis of implementing the scheme shall be conducted, and this will be the basis for the changes.
5. Mapping the situation of the heating sector and determining the necessary activity areas.
6. Starting in 2013, implementing more stringent energy efficiency requirements for new buildings and buildings slated to undergo renovation. The state shall set a role model, establishing new public sector buildings to be as energy efficient as possible.
7. Continuing investment into public and local government buildings' energy conservation.
8. Continuing the assistance scheme for renovating apartment buildings, supplementing it on the basis of experiences gained during the implementation period.
9. Developing an assistance scheme for energy-efficient renovation of private homes covering renovation of the home and the renewable energy solution.
10. Developing and implementing an assistance measure for more energy efficient industrial enterprises and a financial instrument that includes energy audit assistance and provision of financing opportunities for activities arising from the audit.
11. Establishing a countrywide electric car infrastructure.
12. Developing and implementing an assistance measure for the purchase of 500 electric cars for private consumers.
13. Adopting energy class labels for vehicles in order to raise the awareness of consumers, including creating a CO_2 emissions indicator search parameter on car sale websites.
14. Launching a measure for more extensive use of renewable energy sources to produce energy.
15. Establishing an investment grant for wind-based power producers.

With regard to an environmentally friendly economy and energy sector, the following objectives have been set for 2020:

- The limit for greenhouse gas emissions in 2020 may be 11 percent higher than in 2005;
- The share of renewable energy must make up 25 percent of end energy consumption;
- End consumption of energy must remain at the 2010 level – i.e. energy end consumption must be reduced by 11 percent compared to the projection for 2020.

4.2.2. The "Sustainable Estonia 21" national strategy for Estonia's sustainable development

"Sustainable Estonia 21" is a strategy for developing Estonian state and society up to 2030. The strategy creates a general framework for integrating the social, economic and environmental field in the long-term development of society and specifies the general development directions for Estonia to move toward a more knowledge-based society. The long-term development goals are the vitality of the Estonian cultural space (preservation of national traditions), increase in well-being, a cohesive society (without sharp social conflicts) and ecological balance.

The national sustainable development strategy envisions, as the trends affecting Estonia in future, as broadening of consumer society and welfare society model, accompanied by a need for balancing the negative sides of a consumerist society.

The section of the strategy on ecological balance sets the objective of ensuring sustainability, which is seen as making a contribution to the global development. It adheres to the principle of maintaining a balance at all levels of the living environment in terms of both matter and energy cycles. The strategy supports, along broad lines, the growth of the share of generation of energy based on renewable energy, but a threat is also seen in growing pressure on the natural environment and biodiversity. The use of fossil fuels or other non-renewable natural resources should take place based on the principle of use only until such time as they can be replaced with some other resource, such as a renewable one. The Estonian energy sector must be reorganized, supporting and according priority to energy conserving activities. Types of transport that are more sustainable must be preferred. As problems of landscape use will inevitably arise with generation of energy from renewable materials – destruction of habitats, an additional burden on bioresource collection, noise, despoiled landscapes etc – mechanisms that allow the harmful environmental impact to be adequately evaluated and compensated must be developed.

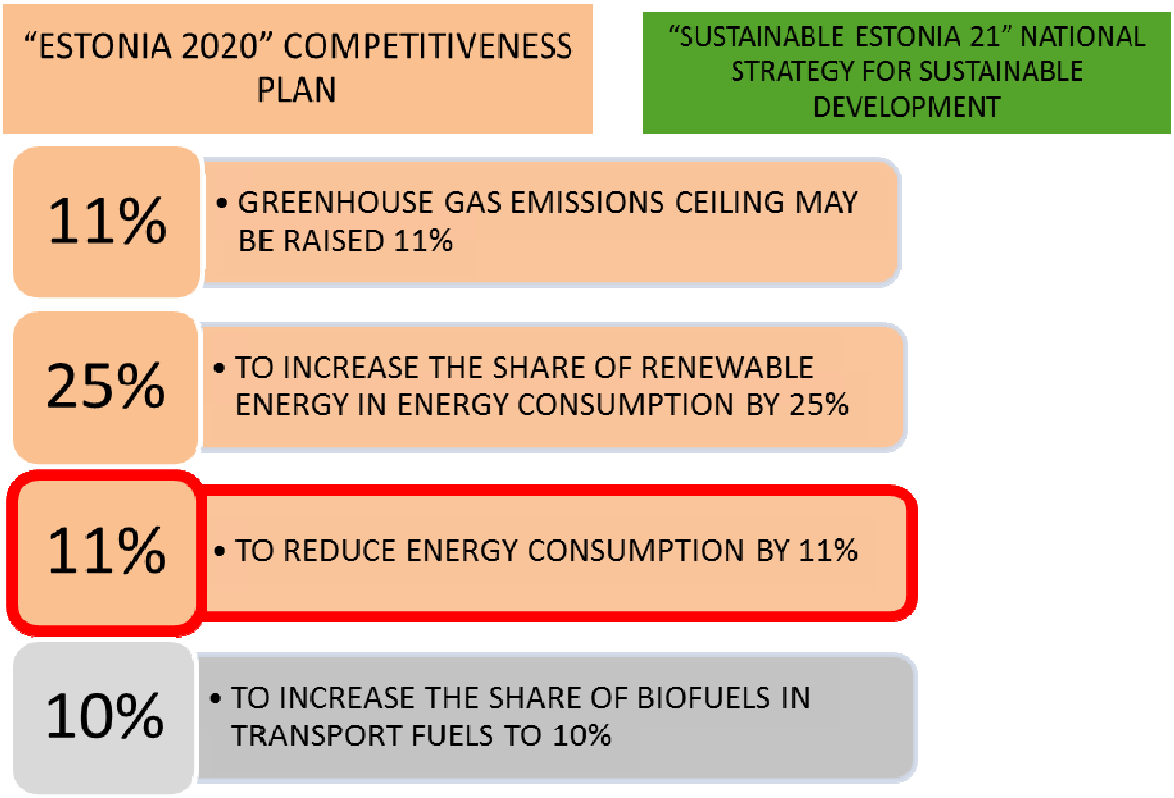
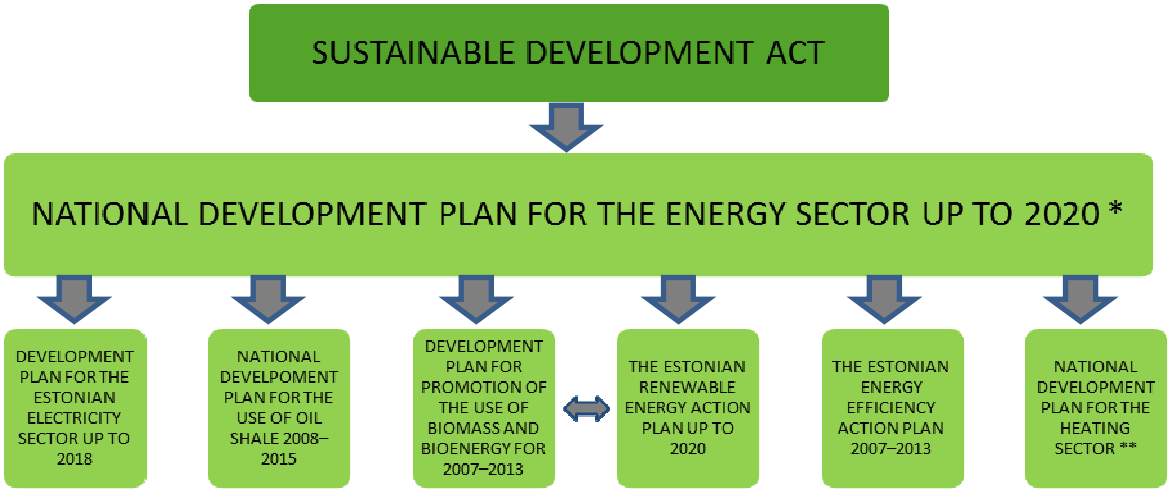


Figure 4.2. Estonia's climate and energy targets

4.3. Development plans related to Estonian national energy security

The basis of Estonia's energy security is the national development plan for the energy sector up to 2020, which is divided into five development parts (potentially into six). The following is a brief overview of them.



* Replaced "National long-term development plan for fuel and energy up to 2015".

**Potential development plan.

Figure 4.3. Development plans related to national energy security

Sustainable Development Act[15]

The Sustainable Development Act sets out the fundamentals of the national strategy for sustainable development, and the fundamental principles for sustainable use of the natural environment and natural resources. The goal of the sustainable use of the natural environment and natural resources is to ensure an environment that is to people's satisfaction and the resources necessary for economic development, without causing significant damage to nature and preserving natural diversity.

In economic sectors and regions where pollution of the natural environment and use of natural resources could pose a risk to natural balance or biological diversity, development shall be directed on the basis of a development plan initiated by the state. A development plan is prepared for guiding developments in the field of energy, transport, agriculture, forestry, tourism, and chemicals, construction material and food processing.

National development plan for the energy sector up to 2020[16].

The goal of the national development plan for the energy sector is to integrate specific development plans in the field and to provide general directions in energy policy up to the year 2020.

The energy sector development plan is the basis for the following development plans in the field of electrical energy, oil shale, biomass and bioenergy, renewable energy and heating and for the energy efficiency action plan.

[15] https://www.riigiteataja.ee/akt/874359?leiaKehtiv

[16] http://www.mkm.ee/public/ENMAK.pdf

1. THE DEVELOPMENT PLAN FOR THE ESTONIAN ELECTRICITY SECTOR UP TO 2018[17] sets strategic goals for development of the electrical energy sector for the next ten years, describing objectives and measures for achieving them with regard to ensuring electrical supply, reducing environmental burden, creating international energy connections, opening the electrical market and growth of electrical consumption.

The same goals have importance in the current energy sector development plan as well.

2. THE NATIONAL DEVELPOMENT PLAN FOR THE USE OF OIL SHALE 2008–2015[18] aims to ensure that Estonia is kept supplied with oil shale energy and to guarantee the country's energy independence. In addition, the development plan highlights the need to find ways of gradually decreasing the amount of oil shale use each year to 15 million tons by 2015. The strategic goal set forth in the development plan for use of oil shale – to increase the effectiveness of mining and using oil shale – supports the energy sector development plan's objective of ensuring sustainable supply and use of energy in Estonia.

3. THE DEVELOPMENT PLAN FOR PROMOTION OF THE USE OF BIOMASS AND BIOENERGY FOR 2007–2013[19] envisions favourable conditions for the development of domestic biomass and bioenergy production in order to reduce Estonian dependence on imported resources and fossil fuels and to ease pressure on the environment. The expanding use of biomass as a raw material is consistent with the objective of the energy development plan – to ensure a constant energy supply by way of diversifying energy sources and distributing them more evenly in the energy balance.

4. THE ESTONIAN RENEWABLE ENERGY ACTION PLAN UP TO 2020[20].The action plan is divided into the following parts: 1) energy end consumption forecast, 2) objective and development curves, 3) measures, 4) evaluation. The objectives of the action plan are to bring the share of renewable energy in the end consumption of all energy to 25% by 2020; and the share of biofuels in transport fuels, to 10%.

5. THE ENERGY EFFICIENCY ACTION PLAN 2007–2013[21] articulates the aims of Estonia's fuels and energy policy for 2007-2013 and the measures necessary for achieving them.

The aim of the programme is to ensure the more effective use of fuels and energy in Estonia, this being a key component in complying with the objectives of the energy sector development plan in fields related to energy conservation and energy efficiency.

The action plan proceeds from Article 4 of directive 2006/32/EC, which obliges all member states to reduce energy consumption by 9% in the next 9 years compared to the average energy consumption in 2000-2005 in sectors belonging to the scope of application of the directive.

The sub-objectives arising from the programme's overall goal and vision.

- Availability of energy conservation information.

[17] https://valitsus.ee/UserFiles/valitsus/et/valitsus/arengukavad/majandus-ja-kommunikatsiooniministeerium/Eesti_elektrimajanduse_arengukava.pdf

[18] https://www.riigiteataja.ee/aktilisa/0000/1305/7849/13058929.pdf

[19] http://www.agri.ee/public/juurkataloog/BIOENERGEETIKA/bioenergia.pdf

[20] http://www.mkm.ee/public/nreap_EE_final_101126.pdf

[21] https://valitsus.ee/UserFiles/valitsus/et/valitsus/arengukavad/majandus-ja-kommunikatsiooniministeerium/energias__stu_programm_kinnitatud05.11.07.pdf

The objective is to make information on conservation of fuels and energy better available to and more often used by energy consumers, organizers of energy management and energy companies and to get consumers to prefer more energy efficient equipment.

- Existence of skills and experts.

  The objective is to ensure constant learning in the field of energy conservation for specialists in the area of energy, construction and civil engineering works and to expand the range of NGOs that offer energy conservation training.

- Consumption of fuels and energy, making generation and transmission more efficient.

  The objective is to find new opportunities for financing fuels and energy and to support projects aimed at conserving fuels and energy.

- Fulfilling functions arising from the EU's fuels and conservation policy.

  The objective is to ensure the EU's directives dealing with fuels and energy conservation (2002/91/EC, 2005/32/EC and 2006/32/EC) are transposed and that the performance of their implementation is evaluated.

INTERIM SUMMARY OF IMPLEMENTATION OF THE ENERGY EFFICIENCY ACTION PLAN 2007-2013 AND FURTHER IMPLEMENTATION OF THE PLAN[22]

The deliberation that took place in May 2011 in Parliament examined, as a matter of national importance, topics of energy conservation and efficiency in Estonia. At this deliberation, the Minister of Economic Affairs and Communications named seven key directions of activity that will be focused on in Estonia in implementing energy conservation and efficient policy in the coming years. They are the following:

Continuing support programmes for energy conservation activity in apartment buildings. The support funds to date have been used to carry out the activities that are economically the most expedient. Likely the total support volume will end up covering under one-fifth of the work that is needed to be done. Billions of euros must still be invested to bring apartment buildings into conformity with contemporary energy efficiency and interior climate requirements. The two major financing sources could be the proceeds of sale of CO_2 allowances received by the state from 2013 on, and structural funds to be allocated to Estonia in the next EU financial period. Alongside the assistance measures offered by the public sector, private sector investments must be stimulated for increasing the energy efficiency of apartment buildings.

Measure to be developed to support energy conservation activities in smaller buildings. One-third of Estonia's households live in private houses. On the one hand, data on end consumption of energy in the households sector point to inefficient use of energy while on the other hand, studies indicate that interior climate is in poor condition in these private houses. The tax refunds offered thus far on interest paid on renovation loans do not motivate owners to insulate their buildings. The support programme for renovation of private houses will be launched on 30 April 2012 (volume of support is 4 million euros).

Implementation of the public sector building renovation programme. The total volume of the investment programme implemented up to 2013 is 146.5 million euros and it will allow close to 480

[22] http://ec.europa.eu/energy/efficiency/end-use_en.htm

public buildings to be renovated in order to be more energy-efficient. In addition, the renovation of the buildings will be supported from EU structural funds. Large-scale renovation of buildings is necessary for reducing energy costs in the public sector and to serve as a role model for other sectors. Upon harmonization of the energy efficiency directive to be transposed by July 2012, more stringent minimum requirements for energy efficiency of buildings are planned.

Increasing the competitiveness of industry and small enterprise through energy efficiency. With the support of Enterprise Estonia, companies have been offered (and will continue to be offered) a number of development opportunities, such as the industrial enterprise technology investment programme, knowledge and skills development grant and the development personnel secondment grant. In the framework of the implementation of the Estonia 2020 competitiveness strategy, it is planned to develop and implement an assistance measure for more energy efficient industrial enterprises and a financial instrument that includes energy audit assistance and provision of financing opportunities for activities arising from the audit. Implementation of these activities will also require that the number of expert industrial energy auditors be expanded.

Energy conservation in transport. Energy use in transport sector can be kept under control in three ways: by reducing the need for transport, making public transport more usable and increasing the efficiency of the vehicles. The use of vehicles is also effectively controlled by the excise duty on motor fuel. By reducing the need for transport and increasing the economy of vehicles, it will be possible to achieve changes in both passenger and freight transport, while improving usability of public transport will reduce only the energy use by private vehicles. To achieve an appreciable impact, all three areas must be dealt with. Currently the main activity is increasing the economy of motor vehicles by way of purchasing new rolling stock (new trains, buses, gas-powered buses, trams) and implementation of the electromobility programme.

Energy efficiency in the services sector. Energy efficiency in the services sector has increased significantly in the last few years: since 2000 growth has been 60% and it did not taper off, the recession notwithstanding. Determining possibilities for energy savings in this field requires analysis and more detailed energy statistics and monitoring.

Higher-quality implementation of energy conservation policy. To analyze trends in energy sector and energy efficiency, more extensive availability of high-quality data must be ensured. Research to this point indicates that evaluation of the situation with regard to the possibilities of energy conservation remains deficient on many levels. Energy statistics do not provide data on energy consumption in the various subsectors, and it is hard to link energy consumption with the use of different equipment or technologies. The dearth of data also hinders analysis of industrial sites, district heating networks and buildings' energy consumption and planning of conservation measures. Deficient data sets make it harder to perform quality evaluation of the performance of energy conservation policy.

The interim summary of the Energy Efficiency Action Plan 2007-2013 describes in more detail the activities in the areas of implementation energy conservation and efficiency policy. The document explains Estonia's objectives in the field of energy conservation and efficiency, measure and programmes for achieving the goals, the associations between this document and other national policies and implementation of requirements stemming from the energy services directive 2006/32/EC in Estonia.

Directives 2006/32/EC and 2010/31/EU and domestic initiatives (such as the "Estonia 2020" competitiveness strategy) determine the most important objectives in Estonia's energy conservation policy:

- **to ensure that the objective of energy conservation and efficiency stemming from directive 2006/32/EC is fulfilled and to achieve savings of 9.9 PJ (petajoule; 10^{15} J) from measures implemented in 2008-2016, including 6.6 PJ savings as a result of measures implemented in 2008–2013**;
- to ensure that the energy conservation objective set out in the "Estonia 2020" strategy is fulfilled. The aim of "Estonia 2020" is to keep energy end consumption in Estonia in 2020 at the same level as 2010. That means keeping energy consumption at 121.3 PJ and total energy savings compared to the development plan „Renewable energy action plan up to 2020" of 11.5% - 15.7 PJ by 2020;
- **to establish in Estonia, by 2015, at least 10 publicly-accessible special near zero-energy buildings with a useful area of at least 5,000 m^2** total.

Energy conservation in buildings has been the main focus of Estonia's energy conservation policy. The design and construction of most Estonian buildings has adhered to construction standards that did not put enough value on energy conservation. Adapting buildings to modern energy efficiency levels requires several billion euros. Buildings use a total of 47 PJ – and the estimated potential energy conservation is 25%. The energy savings forecast for 2016 if the measures described in the interim summary of the Energy Efficiency Action Plan 2007-2013 are described will be around 3.5 PJ.

An analysis of the ongoing and functioning national programmes and measures (one of the goals of which is to modernize existing apartment buildings and public buildings or construct new ones) showed that their total cost in the period 2008-2013 (2015) will be close to 650 million euros. Undoubtedly there are a noteworthy number of activities in these programmes not related to energy savings, but nonetheless these will make a significant contribution to the improvement of the general condition of Estonian buildings and their energy efficiency. The result of construction that picked up due to the measures developed in 2009 and 2010 has been a rise in construction prices, linked to growing demand for construction work, not just in Estonia but in the Nordic countries as a whole. As the borrowing capacity of apartment associations and customers has not seen equal improvement, the state measures must also be directed to keeping up strong demand for building renovation.

A very important measure for sustainable consumption of energy in buildings is high-quality implementation of regulations on their energy efficiency. In terms of raising the qualification of specialists dealing with these matters and ensuring the functionality of requirements, Estonia still faces much more work (specifically measures in Annex 1).

6. NATIONAL DEVELOPMENT PLAN FOR THE HEATING SECTOR. District heating is widespread in Estonia, yet there have been problems in developing market relationships in this field (questions regarding coordination of prices, impact of monopoly status of the market, impact from local governments on pricing, efficiency indicators etc). The relatively large dependence on natural gas (over 48% in 2006) and the notable price rise from the rising prices of energy sources is leading to the need to diversify the sources of energy for district heating. At the same time, all district heating enterprises are not capable of making the necessary investments. The development plan for the heating sector must put in place the extent and desirable development areas for local heat generation methods (heat pumps, local and imported energy sources). This is a potential development plan.

5. Building stock, energy consumption and workforce

5.1. Statistical data on construction work volumes, types of buildings entering use and renovation work

The construction sector's workforce and financial volumes have a significant weight in the Estonian economy. According to Statistics Estonia, in 2011 Estonian construction companies performed 1.68 billion euros worth of construction using their own workforce (in prices current for that period). That was 27 percent more than in 2010. The primary growth stemmed from repair and renovation work, where construction volumes grew due to public sector investments and investment grants aimed at residential building associations.

Table 5.1 illustrates how the construction work is distributed and changes in the trend in recent years.

Table 5.1. Construction work in 2005–2011, in current prices[1]

	Total construction work, millions of €	Construction work in Estonia, millions of €	Share of work performed in Estonia, %	Construction work performed abroad, millions of €	Share of work performed abroad, %	Construction work performed using own workforce, millions of €	Construction work performed in Estonia using own workforce, millions of €
2005	2 472.1	2 376.8	96	95.3	4	1 546.2	1 481.5
2006	3 299.2	3 212.5	97	86.7	3	2 074.3	1 989.6
2007	3 954.3	3 807.5	96	146.8	4	2 627.1	2 500.7
2008	3 616.6	3 472.3	96	144.4	4	2 298.8	2 162.7
2009	2 379.6	2 226.3	94	153.3	6	1 502.2	1 372.2
2010	1 902.2	1 731.0	91	171.2	9	1 282.6	1 141.7
2011	2 408.2	2 156.5	90	251.7	10	1 678.7	1 491.4

Construction volumes reached the highest mark in Estonia in 2007, which was followed by a sharp decline in 2009 due to the overall instability in the economic environment. Construction volumes dropped by nearly half compared to the peak period, many companies went bankrupt and unemployment in Estonia rose to unprecedented heights.

Construction of residential and non-residential buildings dropped dramatically during the years of the crisis. The field of roads and infrastructure has remained fairly stable in recent years, and fluctuation of construction volumes was lowest during the crisis in this field as well. The level has remained stable due mainly to financing of infrastructure from EU structural funds, from which the principal part of the investments was made into roads and infrastructure. Table 5.2 characterizes the distribution of construction between different types of buildings.

[1] Statistics Estonia. Table EH0012: general statistics for the construction sector.

Table 5.2. Construction work performed in 2005-2010 in Estonia using own workforce, in current prices[2]

Type of building	2005	2006	2007	2008	2009	2010
Total buildings	**1 551.6**	**2 208.9**	**2 757.6**	**2 397.4**	**1 514.6**	**1 275.4**
Total residential buildings	**369.1**	**622.2**	**659.6**	**359.1**	**229.8**	**200.5**
one- and two-family dwellings	80.7	135.9	172.7	112.9	80.4	72.8
row houses	18.0	50.7	42.3	28.0	15.9	14.2
apartment buildings	255.6	418.7	412.5	192.8	122.8	110.3
social welfare institutions and temporary residential facilities	14.8	16.8	32.0	25.4	10.7	3.3
Non-residential buildings, total	**623.2**	**886.8**	**1 294.0**	**1 220.0**	**672.1**	**517.9**
hotels, similar accommodation and food	37.4	71.7	89.7	51.4	23.0	22.9
office buildings	115.5	158.1	272.5	227.3	141.2	90.0
commercial and service buildings	70.9	126.0	233.6	212.6	116.0	64.3
transport and communications buildings	22.3	18.6	46.1	32.7	16.7	13.7
industrial and warehouse buildings	157.4	265.3	287.0	294.8	143.7	146.1
entertainment, education, health care and other public buildings	140.9	147.4	187.3	234.3	156.1	107.9
other non-residential buildings	78.9	99.8	177.9	167.0	75.4	72.9
Total infrastructure	**559.3**	**699.9**	**804.1**	**818.3**	**612.7**	**557.0**
pipe connections, communications and electrical lines	221.4	231.8	250.0	303.1	216.8	224.4
wastewater and waste handling infrastructure	33.1	41.1	56.3	50.4	30.7	14.6
streets, traffic structures, roads	238.5	344.2	394.7	353.7	291.0	257.3
other infrastructure	66.3	82.8	103.0	111.1	74.2	60.8

The stressful market competition in recent years has significantly improved the competitiveness of Estonian construction undertakings. This is attested to by the significantly higher export indicators in the construction sector. In years past, the share of export in the construction sector has fluctuated between 3-5 percent, but in the first half of 2011, it rose to 10 percent.

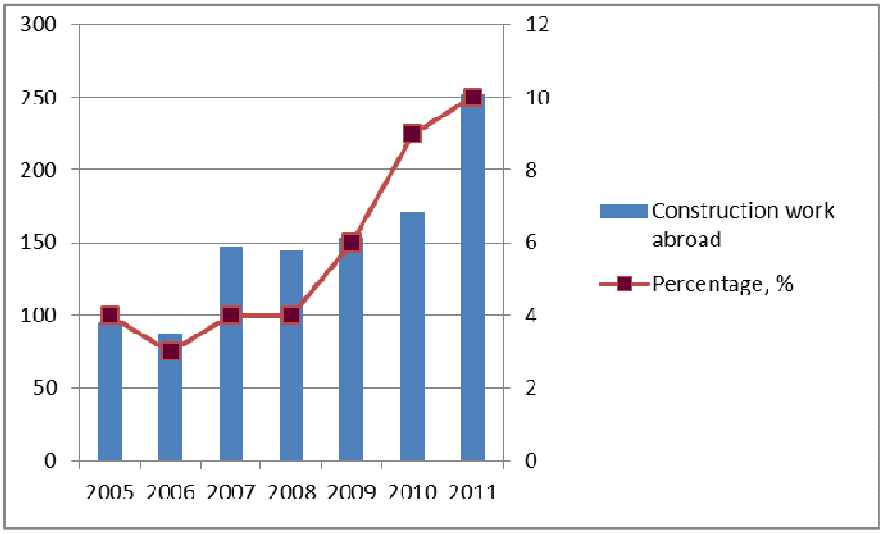


Figure 5.1. Estonian companies' construction work performed in foreign countries (millions of €)[3]

[2] Statistics Estonia. Table EH002: general statistics for the construction sector.

Developments in Estonia's construction sector are shaped by the large share of buildings that have reached the critical limit of their lifespan. A study conducted at the Tallinn University of Technology, "Technical condition and forecasted life expectancy" indicates that in line with the life cycle theory of a building, the average lifespan of a residence is close to 50-70 years. The structures and technical utility networks of residential buildings of this age can be considered physically and otherwise obsolete, as a result of which the building requires maintenance work as well as large-scale renovation. A majority of Estonia's housing stock has reached this age. Considering that the average lifespan of residential buildings is 60 years, it would be necessary each year to construct additional space or renovate about 1/60 of this – 670,000 m²of space.

In actuality, the construction volumes have not reached even the replacement rate in recent years. Although 2011 the volume of renovation work on residential buildings grew significantly, and a total of 518,409 m² of residential space entered use, including new construction, which makes up just 77 percent of actual needs.

Table 5.3. Area of residential space entering use in 2011[4]

Total m²	**518 409**
new construction	205 923
expansion	43 860
renovation	268 626

The share of renovation work will remain large in the construction sector in coming years as well, as many cannot afford to move into new space. The real wages of the population have not kept up with the rise in construction prices in recent years. As purchasing power improves, the share of new construction can once again start growing, significantly impacting the need for workforce in construction.

Table 5.4. Residential space entering use in 2005–2011 (new construction)[5]

	Number of residential units	Area 1000 m²	Average size of residential unit, m²
2005	3 928	325.6	82.9
2006	5 068	392.0	77.3
2007	7 073	566.7	80.1
2008	5 300	458.4	86.5
2009	3 026	305.0	100.8
2010	2 324	237.8	102.3
2011	1 918	205.9	107.4

[3] Statistics Estonia. Table EH0012: statistics for the construction sector: Construction work in current prices.

[4] Statistics Estonia. Summary of tables EH045–047: statistics on building permits and authorizations for use.

[5] Statistics Estonia. Table EH045: statistics on building permits and authorizations for use.

5.2. Statistics on and regulation of energy-efficient buildings

Energy efficiency of buildings is regulated in Estonia primarily by Government of the Republic regulation no. 258 of 20 December 2007, "**Minimum energy efficiency requirements**", in accordance with which the conformity of new and significantly renovated buildings to minimum requirements for energy efficiency must be certified. The regulation also establishes minimum requirements for energy efficiency and source data and computational methods necessary for certifying conformity to the requirements.

Up until 2012, Estonia did not use precisely defined building type names based on the energy efficiency classification. The only feature in use is the classification specified in the energy label: category A–H. For all intents and purposes, buildings with category A energy labels can be considered low-energy structures, but there are still very few of these, even though the growth trend is strong. In early 2012 saw the start of extensive discussion was aimed in part at adopting internationally known and widely used terminology and integrating them logically with energy efficiency classes.

- A **low-energy building** expends significantly less energy than a conventional building. This is a largely subjective classification which mainly does not relate to specific and unequivocally comparable energy consumption figures. In general, the term low energy building is considered to be one where heating costs are about half as much as specified in local construction regulations and standards for equivalent buildings.
- A **net zero energy building** has a primary energy expenditure of 0 kWh/m^2 per year. This is a building that is connected to a standardized energy system network whose annual primary energy expenditure is equal to the amount of primary energy sold to the network each year, meaning that the annual primary energy balance is zero.
- A **nearly net zero energy building** has very high energy efficiency and its primary energy expenditure is greater than 0 kWh/m^2 per year.

  Internationally, the definition of a nearly net zero energy building is as follows: nnZEB = very high energy performance + on-site renewables. The term very high energy performance is up to each member state to define and thus nnZEB buildings can have very different energy efficient indicators from one country to the next.
- A **passive house** is a concept developed out of scientific interest in how far a house's energy costs can be reduced. The central idea behind a passive house is to reduce heating losses to the point where the house can be heated only by heating the incoming air. The passive house standard does not specify what materials are to be used in achieving the necessary outcome.
- An **active house** is a building where the annual primary energy use is less than the annual primary energy quantity transformed from renewable energy sources and sold to the network.

The "Minimum energy efficiency requirements" regulation lists quantifiable criteria that characterize the building's total energy use. They are expressed by **energy efficiency** with regard to **buildings**

being designed and **weighted energy use** for **existing buildings**[6]**.** The energy efficiency number comprises the building's total energy use for maintaining the interior climate, heating water for household use and expenditure on other electrical equipment.

Table 5.5. Energy efficiency classes on the energy label for residential buildings[7]

Energy efficiency for **smaller dwellings**		Energy efficiency in **apartment buildings :**	
value, kWh/m^2 per year	class	value, kWh/m^2 per year	Class
ET or KEK ≤ 120	A	ET or KEK ≤ 100	A
121 ≤ ET or KEK ≤ 130	B	101 ≤ ET or KEK ≤ 120	B
131 ≤ ET or KEK ≤ 150	C	121 ≤ ET or KEK ≤ 150	C
151 ≤ ET or KEK ≤ 190	D	151 ≤ ET or KEK ≤ 200	D
191 ≤ ET or KEK ≤ 250	E	201 ≤ ET or KEK ≤ 250	E
251 ≤ ET or KEK ≤ 320	F	251 ≤ ET or KEK ≤ 300	F
ET or KEK ≤ 321	G	ET or KEK ≤ 301	G

Red line – maximum permissible limit on the basis of the regulation.

The legal basis for issue of energy labels is Regulation No 107 of the Minister of Economic Affairs and Communications of 17 December 2008 on the energy label form and issuing procedure.[8] The energy label is a document that shows how much energy a building or part thereof uses for heating, cooling, hot water heating, ventilation, lighting etc.

From 1 January 2009, **all existing buildings or apartments** to be bought or sold must have an energy label. The seller must hand over the energy label to the buyer upon execution of the transaction of purchase and sale. The energy label for an existing building, marked E for Existing, consists of four parts. The first part, which is the title page of the label, provides the most important information: data on the building, its weighted energy use and energy class and information on the issuer of the energy label. In the second part of the energy label, the issuer of the label provides recommendations as to what energy conservation measures could be adopted justifiably in the building; there is also a photo of the building and, if necessary, comments. The latter are added above all if circumstances arise that may significantly influence the building's weighted energy use (e.g. interior climate varies from ordinary values, building is partly in use, building is not in continuous use).

[6] Government of the Republic regulation no. 258 of 20 December 2007 "Minimum energy efficiency requirements", https://www.riigiteataja.ee/akt/12903585?leiaKehtiv

[7] Government Office legal and analysis department. Summaries no. 18/7 November 2011 "Energy conservation in buildings and statistics on energy labels" on the basis of Minister of Economic Affairs and Communications regulation no. 107 of 17 December 2008, https://www.riigiteataja.ee/akt/129122010034

[8] https://www.riigiteataja.ee/akt/13094120?leiaKehtiv

Table 5.6. Energy label notices issued to existing buildings according to energy efficiency class[9]

Type of building	Energy efficiency class							
	A	B	C	D	E	F	G	H
Residential buildings	71	64	292	1521	1905	734	234	–
Non-residential buildings								
office and commercial buildings	4	2	13	23	34	35	36	31
industrial and warehouse buildings	–	3	4	6	3	4	3	3
public buildings	–	7	39	47	46	60	22	7

All new buildings where the design was launched in 2009 must have an energy label. In such a case, the energy label must be presented to the local government upon applying for a building permit. The energy labels for new buildings have the code N (New) which indicates that it is a calculated label: conformity to energy efficiency criteria is assessed mathematically on the basis of the building's project documentation. Energy use depends to a significant extent on the times and intensity of use of the building (unlike heating and electrical loads) and thus the total energy expenditure is calculated based on standard use of the building. It is not known on the basis of a given object whether the building was also in actuality completed: the time between the issue of the label and the completion of the building varies and is not treated in the general database.

Table 5.7. The calculated energy label notices issued to new buildings by energy efficiency class[10]

Type of building	Energy efficiency class							
	A	B	C	D	E	F	G	H
Residential buildings	179	146	408	535	124	8	11	–
Non-residential buildings								
commercial buildings	–	5	12	24	22	6	1	–
industrial and warehouse buildings	–	3	6	6	5	1	–	1
public buildings	4	10	32	21	18	9	1	2

As can be seen in the preceding tables, the share of **buildings with good energy efficiency class is greater in new buildings than it is among existing buildings.** The reason is the high cost of renovation work, the particular nature of ownership relations and the low awareness and motivation on the part of market participants. To improve the energy efficiency of existing buildings, the state has taken specific steps to stimulate renovation activity in the case of apartment buildings and public buildings. To this point, renovation has mainly been limited to insulating roofs and the building shell and replacing windows. **As awareness grows, the list of work has grown, now including renovation of interior climate systems and, in some cases, improved building control systems.** Such integrated packages of measures have resulted in significantly better results as regards energy efficiency and have increased the share of class A and B energy labels.

[9] Extract of Building Register data. All energy label notices issued as of 31 December 2011.
[10] Ibid.

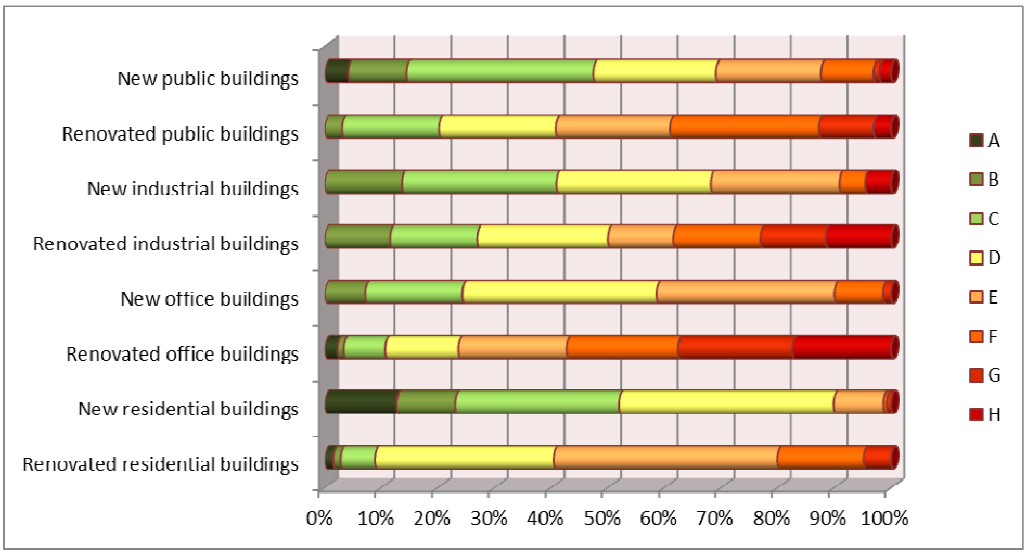


Figure 5.2. The energy efficiency of new and renovated buildings by the end of 2011 on the basis of issued labels

The statistical data collected do not encompass the distribution of the renovation work. Thus it is not possible to cite more specific data as to how the renovation measures have influenced the building's energy efficiency. A comprehensive database would make it possible to analyze the field at a new level: it would clarify the impact of different renovation work on building energy efficiency and it would be possible to better plan state measures. KredEx has started gathering and systematizing information on renovation work in apartment buildings and energy efficiency. Unfortunately this activity pertains to only apartment buildings renovated using the supported measures. There is no corresponding system for commercial real estate and other residential buildings. It is not known how great the percentage of renovated, more energy efficient real estate in the entire sector is, nor is it known how big are the savings as a result of renovation.

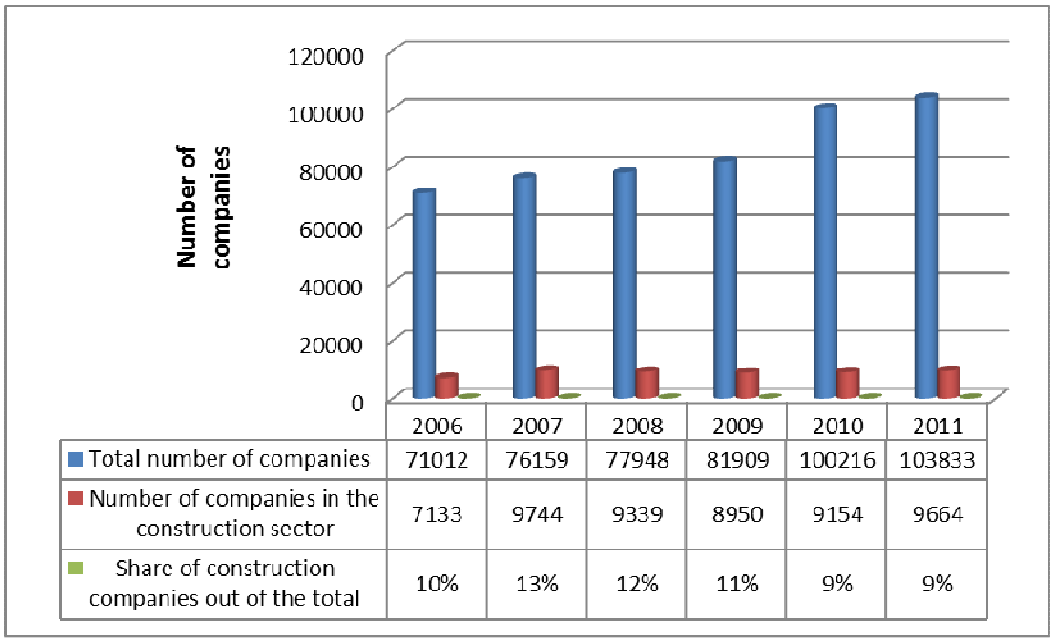
5.3. Statistics and general description of companies operating in the construction sector

The Estonian construction sector is largely oriented at the internal market and thus has been impacted mainly by Estonian economic development. The construction sector responds fairly abruptly to changes in the economy. In good times, construction volumes grow quickly and as economic growth slows, volumes decrease significantly. Just as the downturn in 1999 affected the construction sector (primarily due to the decrease in office building construction) the last few years have also been very unfavourable for the construction market and related fields (spatial planning, architecture, design and engineering, real estate). Construction volumes in regard to infrastructure have also decreased. The capability of local governments to co-finance projects is limited and due to the general austerity policy on the state level, it is not possible to implement as many EU structural fund projects as previously. Secondly, a drop in demand has brought down construction prices.

According to Statistics Estonia data, over 9,600 companies in Estonia indicated construction as their primary area of activity in 2011.[11] Over 90 percent of these were microenterprises with fewer than 10 employees; there are few companies in the construction sector with more than 250 employees. Ascertaining the number of active companies is very difficult due to the large percentage of microenterprises. The most realistic approach to ascertaining the numbers of active companies is to rely on

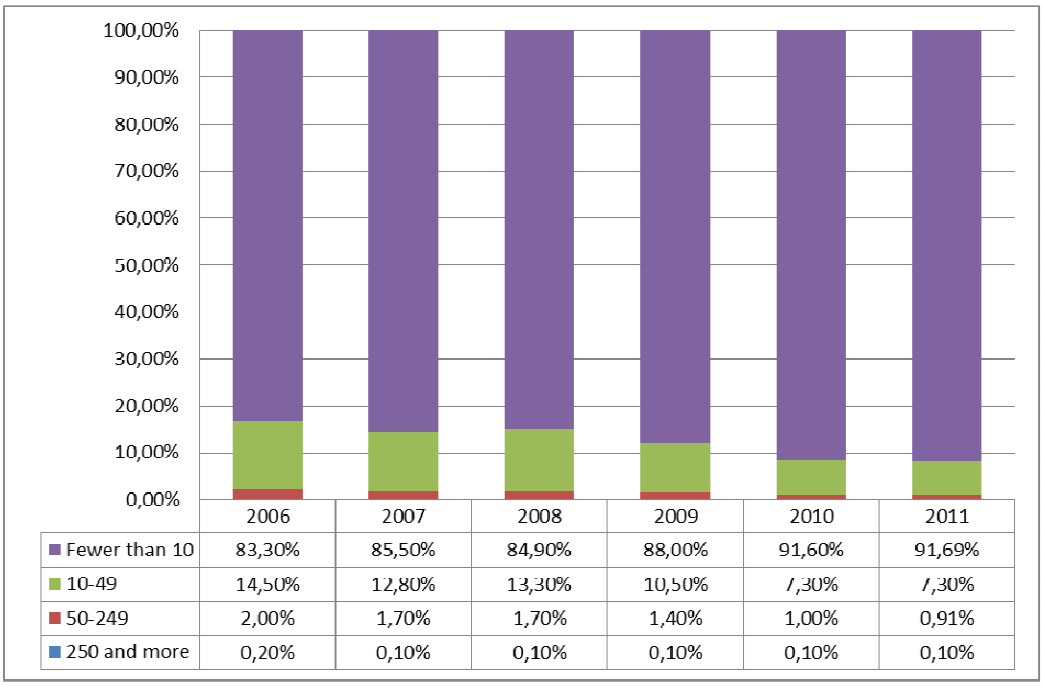
[11] Statistics Estonia. Construction economic indicators, table EH032 (classification of areas of economic activity EMTAK 2008, area of activity F – construction).

the data from the Register of Economic Activities, which indicated that as of January 2012 there were 4,600 companies with an activity license in construction. The major difference between the Register of Economic Activities and Statistics Estonia data is due to particularities in data collection and points to significant movement in the sector during the year (number of companies wound up and started). This movement primarily pertains to microenterprises with less than 10 employees. In recent years, there have been numerous mergers, dissolutions, bankruptcies, and divisions among construction companies.



	2006	2007	2008	2009	2010	2011
Total number of companies	71012	76159	77948	81909	100216	103833
Number of companies in the construction sector	7133	9744	9339	8950	9154	9664
Share of construction companies out of the total	10%	13%	12%	11%	9%	9%

Figure 5.3. Number of construction companies and share in the total number of companies



	2006	2007	2008	2009	2010	2011
Fewer than 10	83,30%	85,50%	84,90%	88,00%	91,60%	91,69%
10-49	14,50%	12,80%	13,30%	10,50%	7,30%	7,30%
50-249	2,00%	1,70%	1,70%	1,40%	1,00%	0,91%
250 and more	0,20%	0,10%	0,10%	0,10%	0,10%	0,10%

Figure 5.4. Distribution of companies according to number of employees (%)

The number of large construction companies has remained constant in recent years: companies that use primarily the prime contracting method have been sufficiently capitalized to survive the recession. The biggest prime contractors for general construction in Estonia are Skanska EMV AS, AS Merko Ehitus, AS YIT Ehitus, AS Nordecon International and AS Koger & Partnerid. In road construction, the biggest players are AS Teede REV-2, AS Nordecon Infra (part of the AS Nordecon International group) and AS Talter.

Companies based on local capital make up a large majority of Estonian construction companies. Over 90 percent of companies in the construction sector are microenterprises (under 10 employees). The abundance of microenterprises points to the fact that specialization is widespread in the construction market. The predominant form of work is construction based on the project management method, where tens of contractors take part on the basis of different tiers of subcontracting agreements in building on one site and the prime contractor or project management company is in charge of all of them. The project management method supports a more cost-effective use of resources and ensures that the construction companies have greater flexibility to adapt to crisis and peak times.

As to the nature of their contract work, Estonian construction companies can be divided into three types.

- **Contractors** – construction companies whose activity focuses on some narrower type of work (electrical, concrete, finishing etc). These are predominantly micro-companies with fewer than 10 employees (most of whom are construction workers).
- **Project management companies** – construction companies that do not perform construction themselves but manage and coordinate the work of subcontractors. As a rule this category includes companies with 10-49 employees, most of them engineering and technical personnel. Project management companies generally do not have their own construction workers.
- **Prime contractors** – construction companies that manage and coordinate the work of subcontractors on the site, but are prepared to perform some types of work using their own personnel as well. This group includes mid-sized companies with 50 or more employees and large companies with 250 or more employees. Usually people operate on the largest, most complicated sites, where the duration of construction is longer. Having one's own workers on certain types of work allows companies to better adapt to changes on the construction market and hedge the risks stemming from fluctuating subcontracting prices. The number of large construction companies has remained constant in recent years, from between 8-13. These are generally companies that compete for contracts for the largest projects. As international companies can also take part in this market segment, the amount of competition on the market can be considered sufficient given the size of the local construction market.

The construction market in Estonia has stabilized in recent years. The market is becoming better organized, specialization is deepening and the division of roles is becoming clearer. Nevertheless the Estonian construction market is quite vulnerable to economic influences due to its small size, and thus periods of boom and decline in various construction fields occur more suddenly than in larger economies. This factor dictates to the market the need to be more flexible to able to respond rapidly to changes. This is directly manifested in the personnel policy practiced by prime contractors: the significant rise in input prices in the construction sector is leading to an increase in work performed in larger construction companies with the respective company's own workforce (more construction workers are being hired for the purpose of forming in-house construction crews). Thus employment at large companies could increase by 10-15 percent. When market prices of construction work start to outstrip input prices, the amount of subcontracting will again increase and prime contractors will downsize their dedicated crews. The Estonian construction market is currently in a situation where use of companies' own workforce is expanding and outsourcing labour is declining.

5.4. The labour market in the construction sector

Unstable economic conditions have had a major effect on the number of those employed in the construction sector. At the peak of the construction boom in 2008 their number was over 82,000, but the economic downturn resulted in a sharp drop and by 2010, 1/3 fewer were employed.

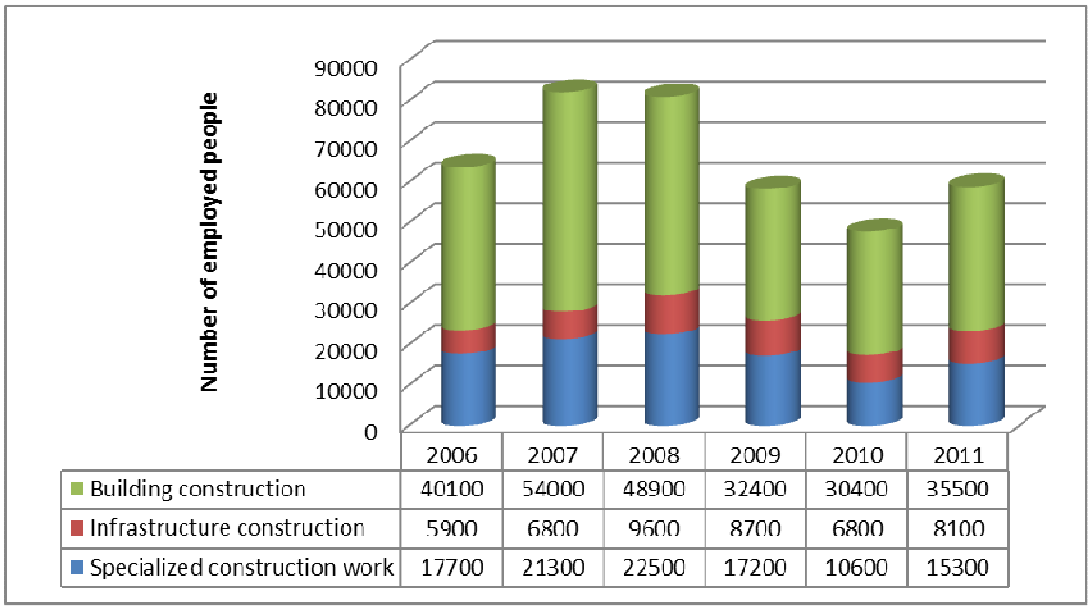
Table 5.8. Number of the employed in the construction sector and the share of all employed[12]

	2006	2007	2008	2009	2010	2011
Employed in all areas of activity, total	646 300	655 300	656 500	595 800	570 900	609 100
Employed in the construction sector	63 600	82 100	81 000	58 300	47 900	59 000
their share of all employed	9.8%	12.5%	12.3%	9.8%	8.4%	9.7%

Comment: annual average, 15–74-year-old employed population.

After exiting the economic downturn, employment in the construction sector has once again risen significantly (compared to 2010, there are now 25 percent more employed in the construction sector). The greatest influence on the growth in construction volumes came from the volume of renovation work, which was due to the measures financed form carbon credit sales, making up close to 60 percent of all building construction. In addition to the energy savings achieved, these measures proved especially important during the economic crisis as regards to retaining employment levels, as the same monetary amount of construction work for renovation requires 3–4 times more workforce than building infrastructure that can be more readily mechanized.

In total, an average of 59,000 employees were employed in the construction sector in Estonia in 2011, of whom 35,500 were engaged in building construction, and 15,300 were engaged in the field of specialized construction and 8,100 were involved in building infrastructure. Those directly engaged in construction accounted for somewhat fewer than in the entire sector, about 41,000 employees in 2011.



	2006	2007	2008	2009	2010	2011
Building construction	40100	54000	48900	32400	30400	35500
Infrastructure construction	5900	6800	9600	8700	6800	8100
Specialized construction work	17700	21300	22500	17200	10600	15300

Figure 5.5. People employed in the construction sector according to primary area of activity (Register of Economic Activities 2008)

[12] Statistics Estonia. Tables TT0200: Employed according to area of activity (EMTAK 2008), http://www.stat.ee/30844?highlight=Tabelid,TT0200:,Hõivatud,tegevusala

A study by the Estonian Institute of Economic Research (as of May 2012) shows that of the 75 companies that took part in the survey, construction workers made up close to 50 percent of the total number of employed at the 75 companies.[13] The study covered large and medium-sized companies, but it can be assumed that the share of construction workers at microenterprises was slightly larger. On the basis of the table shown in figure 5.5, on average **55,700 people per year are employed in building construction and specialized construction.** If we assume that construction workers account for an average of 50-60% of the employees in the construction sector, we arrive at an **average construction worker figure of 27,000 to 33,000.**

Estimating the need for replacements among construction workers, the Institute of Economic Research highlights an important factor influencing workforce supply: the working lifespan of construction workers is shorter than the overall working lifespan, **people retire from construction work predominantly before pension age, on average at 57.3 years**.[14] If we consider also those that leave the workforce (retraining, transfer to another position abroad), then it can be asserted, with the average employment on the construction market in mind, that **the complete renewal of workforce at the construction worker level in Estonia should take place in 20 years**. To do so, the Estonian educational system should train an annual average of 1,300-1,400 construction workers with professional education. Right now, 900-1,000 students graduate from vocational educational institutions each year and studies conducted among alumni of such schools signal that over 30 percent may not start work in their profession. The numbers listed point to a deficit of qualified workforce, which grows with every year.

The statistics on the workforce provide little information for the purposes of this study. The data released do not show how employees are precisely distributed between the areas of activity in the sector, they do not distinguish between workers in closely connected fields (design, architecture, computerization, real estate development, management and maintenance) according to specific areas of activity, or jobs at the manager of specialist level. It is very hard to forecast needs for skilled labour without these data. Through an Institute of Economic Research study, we can to some extent pinpoint how the workforce is distributed between different areas of activity in the sector, while the result tends to reflect data for workforce at medium and large companies, but no generalizations can be made as regards microenterprises.

Table 5.9. The professional structure of construction employees at enterprises of different sizes[15]

Speciality	Number at companies surveyed	Share of enterprises surveyed, %			
		All enterprises	Large enterprises	Medium enterprises	Small enterprises
Concrete construction builders	331	13.8	17.1	8.2	6.4
Finishers	186	7.8	3.5	12.4	22.3
Carpenters	175	7.3	3.8	15.8	9.9
Bricklayers	114	4.8	2.4	9.3	8.9
Moving machinery operators	109	4.6	6.0	2.3	0.7
Environmental technology technicians	61	2.5	1.3	6.3	2.1
Ventilation technicians	53	2.2	1.2	5.4	1.4
Electricians	44	1.8	1.5	3.6	0.4
Welders	43	1.8	2.2	1.3	0.7
Sheet metal workers	21	0.9	1.0	0.4	1.1

[13] "Workforce situation of Estonian construction companies and prospective need for workforce", table 1.2, p. 7. Institute of Economic Research, 2012.

[14] Ibid., table 1.12, p. 18.

[15] Ibid., table 1.3, p. 9.

Other construction workers	324	13.5	16.9	8.2	5.0
General construction ITP	545	22.7	22.8	18.8	29.8
Technical utility systems ITP	173	7.2	9.2	4.7	1.1
Road construction ITP	76	3.2	4.6	0.0	1.8
Other ITP	142	5.9	6.4	3.4	8.5
Total	2398	100	100	100	100
Unspecified	159				
Total construction workers	**1475**	**48.8**	**46.6**	**56.6**	**45.3**
ITP total	**1082**	**35.8**	**40.2**	**22.7**	**37.0**
Other employees	466	15.4	13.2	20.7	17.7
Total	3124	100.0	100.0	100.0	100.0

For the purpose of obtaining information on construction employee training needs, it was asked how many of the employees in construction had a professional education. **Of the companies that responded, about half of the construction workers had a professional education; the figure was 4/5 for the engineering and technical workers** (Institute of Economic Research table 1.3)**.** The differences between the results for 2007 and 2012 are probably due most to the interim changes in the companies: the share of smaller enterprises has increased. At the same time, the educational system data show that those in some fields (welders, machinery operators and technicians for example) have had a good opportunity in the years in between to raise their qualification through longer-term in-service training or formal education. The significant decrease in workforce with specialized training among ventilation technicians, sheet metal workers and concrete workers may, according to experts, signal departure to neighbouring countries.

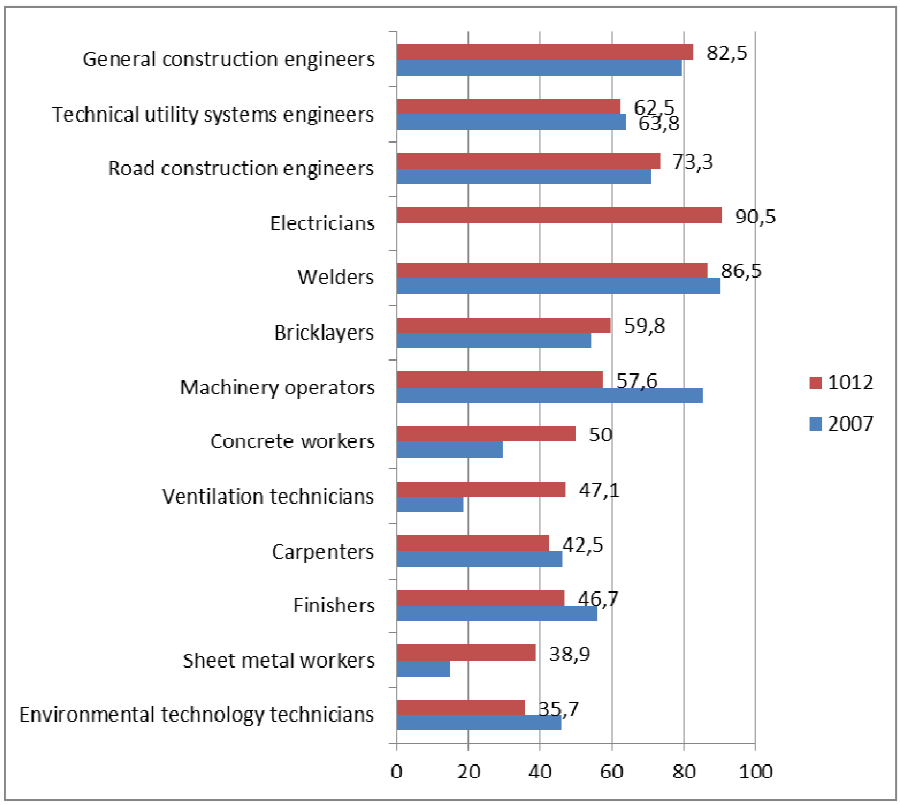


Figure 5.6. Share of employees with professional education in 2012 and 2007 (%)[16]

[16] "Workforce situation of Estonian construction companies and prospective need for workforce ", figure 1.1, p. 10. Institute of Economic Research, 2012.

When analyzing the state of the construction workforce, it is also important to examine competitiveness with regard to wage level. In 2006–2008, the average wage in the construction sector outstripped the overall average gross wage by 10 percent. In spite of the significant decline in the volumes of work and number of employees in the construction sector, wages have remained at the overall average wage level, having started rising in recent years both in absolute figures and with respect to average wage. Compared to other sectors, the average gross wage of construction workers in 2010 was nearly the same level as the wages earned in the water supply, sewerage, waste handling and pollution treatment sector.

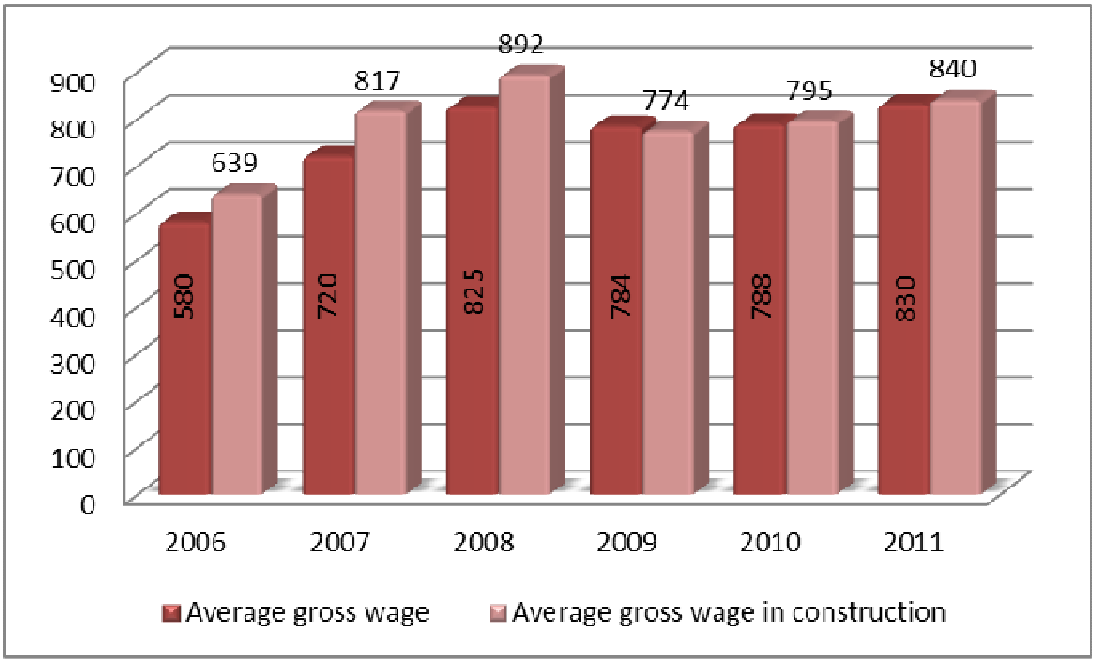
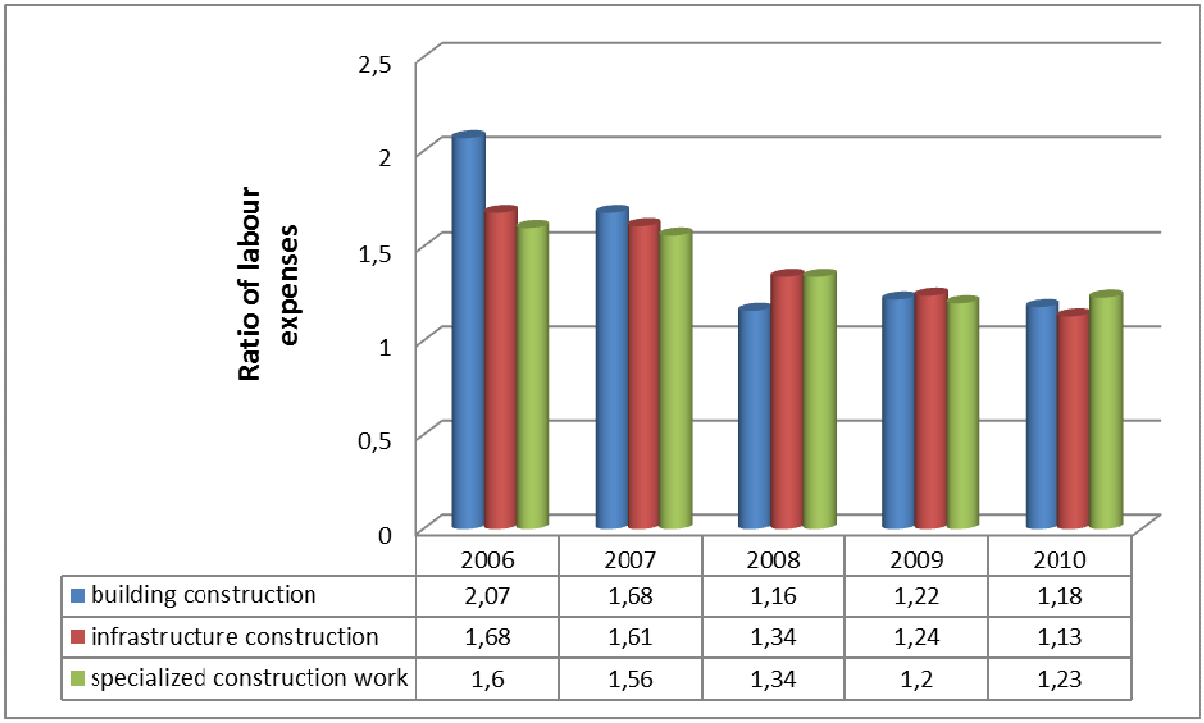


Figure 5.7. Wage level in the construction sector compared to Estonia's average wage (in euros)[17]

The graph shown gives a good overview of the wage levels in the construction sector with respect to the average Estonian wage. The change in the wage has mainly been influenced by two factors. On one hand, it has been impacted by a decrease in work volumes, leading to an outflow of employees into other sectors, and on the other hand, by the shortage of skilled workers in tighter conditions. A major correction took place on the job market in 2009: the average wage level dropped, and the number of employees in the sector also experienced a noteworthy decrease. The leavers were predominantly unskilled workers, but the number of assistants and engineering and technical personnel also dropped. Now the wage level is recovering and pressure for a rise in wages is considerable. The prerequisite for a rise in the wage level is growth in the return on labour expenses and the current level is relatively low.

[17] Statistics Estonia. Sectoral statistics: Construction economic indicators www.stat.ee



	2006	2007	2008	2009	2010
building construction	2,07	1,68	1,16	1,22	1,18
infrastructure construction	1,68	1,61	1,34	1,24	1,13
specialized construction work	1,6	1,56	1,34	1,2	1,23

Figure 5.8. Return on labour expenditure on the basis of value added generated[18]

5.5. Companies' forecast with regard to change in number of employees

A survey of construction companies shows that nearly half of them plan to increase the number of employees in the next few years. The greatest need is for construction workers. Only a few companies plan cuts in workforce and in that case, only in a few construction specialities. The forecasts from companies allowed the overall numbers of employees in different professions to be forecast for the coming years. The increase proved quite sizeable, ranging from a factor of 1.24 (carpenters) to 1.57 (sheet metal workers). Other professions where the companies said employee ranks should be increased included, besides those listed in the table, general construction workers, assistants, technicians, suspended ceiling installers and roofers.

[18] Statistics Estonia. Sectoral statistics: Construction economic indicators www.stat.ee

Table 5.10. Changes projected in employee numbers up to 2015[19]

	Respondents to the question[20] %	At respondent companies %			Growth in employee numbers by 2015 (times)	
		Number of employees in coming years				
		will increase	will remain at same level	will decrease	in growing enterprises[21]	total in profession
Construction workers						
Finishers	91	53.5	44.2	2.3	1.79	1.30
Carpenter	92	58.3	41.7	–	1.47	1.24
Bricklayer	90	54.8	45.2	–	2.11	1.39
Environment technology	83	64.3	35.7	–	1.72	1.37
Ventilation technician	80	72.7	27.3	–	1.76	1.45
Concrete worker	86	73.1	26.9	–	1.47	1.31
Sheet metal worker	71	75.0	25.0	–	2.60	1.57
Machinery operator	75	23.1	69.2	7.7	2.25	1.05
Welder	94	52.6	47.4	–	2.56	1.37
Electrician	87	61.1	38.9	–	1.82	1.43
Other construction workers	74	68.4	31.6	–	1.43	1.19
ITP						
General construction	75	44.4	53.3	2.2	1.19	1.10
Technical utility systems	90	50.0	50.0	–	1.46	1.08
Road construction	100	25.0	75.0	–	1.19	1.05
Other fields	61	33.3	66.7	–	1.95	

Taking into account the underproduction of qualified workforce in the educational system, it is very likely that it will be hard for companies to find suitable workforce in the years ahead. The survey also studied what measures companies are planning to use to resolve the workforce problems. The number-one opportunity is considered by construction companies to be raising the qualification of existing workers, creating contacts in schools and recruiting workers from schools. The readiness of companies to provide for their employees' education and collaborate with the educational system creates a good underpinning for implementing the activities following the project.

Table 5.11. Companies' measures for dealing with shortage of qualified workforce (% of respondents)[22]

	Yes, definitely	Possibly	No, definitely not	Total	% of respondents
Raising qualification of existing employees	64.5	27.4	8.1	100	82.7
Creating contacts with future employees while they are still in school and recruiting workforce from schools	46.7	45.0	8.3	100	80.0
Investing into equipment for raising labour productivity	47.5	33.9	18.6	100	78.7
Implementing overtime for existing employees	8.9	39.3	51.8	100	74.7
Employee search on job market	41.5	40.0	18.5	100	86.7
Buying out employees from other companies	8.8	42.1	49.1	100	76.0
Using foreign labour	7.3	30.9	61.8	100	73.3

[19] "Workforce situation of Estonian construction companies and prospective need for workforce", table 1.4, p. 12. Institute of Economic Research, 2012.

[20] Of the companies already with employees in this profession.

[21] In companies where it was projected that numbers of employees in that profession would be increased.

[22] "Workforce situation of Estonian construction companies and prospective need for workforce", table 1.9, p. 16. Institute of Economic Research, 2012.

The survey[23] also dealt with energy efficient building themes and studied companies' interest in training activity in this area. A total of 31 percent of the companies had employees that dealt with energy efficiency every day. Only a few companies (a total of 10 percent) had had no contact with energy efficiency problems.

Over half of those surveyed had already used energy efficient principles in previous construction work. Of these, 52 percent had upgraded building designs, 53 percent had introduced novel construction materials or products and 54 percent had implemented new technological solutions. Companies had had less contact with amendments to legislation, with 36 percent of companies not up to date with these. Close to one-third of the companies did not deal directly with energy efficiency principles in their work, but they did take part in trainings that introduced new technological solutions and materials.

There were no noteworthy differences between large and small companies with regard to implementing energy efficient principles, but smaller companies took part much less in the trainings. Over half of the companies with under 20 employees were not up to speed with amendments to legislation.

In spite of the fact that they were mainly up to date with energy efficient construction themes, a large majority of companies (83 percent) were more or less interested in having their engineering and technical personnel undergo in-service training with regard to energy efficient buildings and more than one-half of the companies (53 percent) are interested in training their construction workers. A total of 36 percent of companies "definitely" desire to train engineering and technical personnel on the topic of energy efficiency and 13 percent would "definitely" want to do the same with regard to workers.

Interest in studies in this topic is generally higher in larger companies. Without exception, all of the employees with 100 and more employees said they were interested in trainings, and 57 percent of the companies with under 10 employees said they would like to participate in trainings.

5.6. Influence of migration on workforce in the construction sector

A study on workforce based on survey data from the Statistics Estonia showed that the number of employees in permanent positions abroad rose from 8,300 in 2009, 10,900 in 2010 to 13,200 in 2011.[24] The same study showed that the number of people who had worked temporarily abroad during the year was 20-30 percent higher than the above figure. The actual numbers are probably much higher, but due to the survey methods, the Statistics Estonia data set is not capable of conveying precisely the actual number of workers abroad. However, it does give a general sense. Much more precise figures could emerge when the 2011 census figures are published; this is planned in early 2013.

A majority of the construction workers abroad are based in Finland (83-84 percent in 2010-2011, 67 percent in 2009). In 2011, builders made up 60 percent of all people who worked abroad and construction workers made up 70 percent of the Estonian residents who worked in Finland. The annual surveys conducted by the Finnish construction association Rakennusteollisuus RT ry have shown that the share of foreign labour in Finnish construction has tripled in the last five years (2007–2011). Growth in the demand

[23] "Workforce situation of Estonian construction companies and prospective need for workforce", pp. 50–51. Institute of Economic Research, 2012.

[24] Statistics Estonia. General tables on workforce statistics.

for foreign labour is projected to grow in the years to come as well. Namely, a total of 70,000 construction workers (5,000 workers per year)[25] will retire in Finland in the next 14 years, and as the level of unemployment among construction workers is low, local construction worker resources are quite limited there. On the basis of the survey, foreign labour accounted for an average of 20 percent already in 2011, with 33 percent in Uusimaa region. These figures show the workforce officially employed at companies, the more concealed spheres are not included. In total, an estimated 25,000-30,000 employees from abroad are working in Finland's construction sector, based on research by the local construction association in that country. The figures quoted pertain to construction workers, not ITP. An increased need for foreign labour is projected in other regions as well besides southern Finland.

Key destination countries for workforce emigration also include Sweden and Norway, with the share of other countries much lower. The disparity in wages in this field between Estonia and Scandinavia is very large and it is not seen as converging in the near future. And thus emigration pressure in the construction sector will remain a strong influence on the labour supply.

5.7. Overview of the field of renewable energy

In Estonia, a large percentage of electricity is generated from oil shale (85 percent in 2010), and combustion of oil shale releases much carbon – 99.4 tons of CO_2/TJ of fuel. As producing electricity from oil shale is inefficient, the average emission of carbon per unit of electricity is very high – 1,085 kg of CO_2/MWhe. About 94 percent of the CO_2 emissions from power generation comes from oil shale. Emissions figures for oil shale are expressed as a weighted average, considering the two combustion methods in use – pulverized combustion and circulating fluidized bed combustion. As the share of other fuels used to generate electricity is relatively small, the overall average emission is high– 980 kg CO_2/MWhe. Taking into account only fossil fuels, the average is 1066 kg CO_2/MWhe.

From the above data, we can obtain a simplified and approximate figure of a 1.1 million tons reduction in emissions that could be realized by use of renewable sources to generate power. The figure for the heat produced in boiler plants and co-generation plants is 595,000 tons. If all renewable fuels in end use would have to be replaced with fossil fuels, retaining the current ratio of the latter (on the basis of energy content), the annual emissions of CO_2 (at the level of fuel consumption seen in 2010) would be 1.6 million tons greater than at present.

The development of renewable energy in Estonia in recent years has been much faster than planned in Estonia's renewable energy action plan up to 2020. The share of renewable energy exceeded the projected total end use of renewable energy for producing heating and cooling energy and electricity. A noteworthy role in this achievement has been played by the support mechanisms derived form the Electricity Markets Act for renewable-source CHP plants that generate heat and electricity.

The share of renewable energy in end consumption in 2010 proved to be 104 ktoe (4.35 PJ; 1.21 TWh) greater than planned. The Estonian renewable energy action plan up to 2020 predicted that the share of renewable energy in 2010 was 20.9 percent, but in actuality it made up 24.0 percent.

[25] Ulkomainen rakennustyövoima kasvussa – myös suomalaisraketajien työllisyys parantunut (29.11.2010) and Työvoimatiedustelu marraskuussa 2011: Viidennes talonrakennusalan työvoimasta ulkomaista (7 December 2011). www.rakennusteollisuus.fi

The projected quantity of energy generated from renewable sources – the quantity in conformity with the 2020 target – is, based on the action plan forecasts, 863 ktoe (36.1 PJ, 10.0 TWh). In 2010, a total of 770 ktoe of renewable-source energy was generated (32.2 PJ, 8.96 TWh).

Table 5.12. Contribution of various sectors to end consumption of energy (ktoe)[26]

	2009	**2010**
(A) Total end use of heating and cooling energy generated from renewable sources	643	682
(B) Total end use of electricity generated from renewable sources	47	87
(C) Total end use in the transport sector of energy generated from renewable sources	1	1
(D) Total end use of energy generated from renewable sources	691	770
(E) Transfer of renewable sources to other member states	–	–
(F) Transfer of renewable sources from other member states and third countries	–	–
(G) Use of renewable sources after adaptation, taking into account the purpose (D)–(E)+(F)	691	770
Total energy end use	3049	3215

Summarized data on the total contribution made in Estonia by each renewable energy technology toward achieving the compulsory targets of 2020 are listed in table 5.13.

Table 5.13. Installed production capacity and total electricity output from renewable sources in 2009 and 2010 [27]

	2009		**2010**	
	MW	GWh	MW	GWh
Hydro energy (normalized)	7	25	6	22
Geothermal energy	–	–	–	–
Solar energy	–	–	–	–
Tidal, wave and ocean energy	–	–	–	–
Wind energy (normalized)	104	204	108	247
(Electrical) energy generated from biomass	37	313	67	740
TOTAL	148	542	181	1009
of which co-generation of heat and power		229		485

At the end of 2011, the nominal capacity of electrical generation equipment based on renewable sources was 253 MW. According to the Estonian renewable energy action plan, the nominal capacity of electrical generation equipment should be increased to 727 MW by the year 2020, which means 474 MW of growth.

In 2007–2011, close to 500 million euros has been invested into increasing generating capacity in the renewable energy sector, and 87 percent of that amount came from private investors; and close to 13 percent, from the state enterprise Eesti Energia AS. The generating capacity has risen a total of 221.45 MW,

[26] Report of the Republic of Estonia to the European Commission regarding progress in using and promoting energy generated from renewable sources, calculation table 1a. Tallinn: Ministry of Economic Affairs and Communications, 2011.

[27] Ibid., table 1b.

which will keep close to 1 million tons of oil shale from being burned in the furnaces of AS Eesti Energia's Narva Power Plants and thereby also reduce the accompanying environmental pollution. The generation of electricity from local renewable energy sources has grown. It is presumed that as the renewable energy subsidies end, the local electricity generating systems will be competitive on the market. Hundreds of jobs have also been created in forestry, construction and power plant maintenance.[28]

5.8. Local renewable energy solutions used in buildings

Historically, Estonian one-family dwellings, farms and smaller apartments (in wood-heated neighbourhoods) have used wood to heat stoves, ovens, hearths and saunas. In the past, primarily split wood was burned, but today wood briquettes and various other byproducts of the timber industry are used. Whereas in 1936, wood accounted for 86 percent of the fuel used by Estonian households, today the share of wood has fallen to 80 percent. Heating elements are generally replaced in the course of renovating private homes. Back in the 1980s, central heating systems began to be installed in the new detached homes built in that period. The furnaces for these systems have also now been replaced by modern ones, the main part of them being oil and gas furnaces, but the percentage of pellet furnaces is growing. There are no account kept on low-capacity boilers (up to 40 kW) and other heating elements (ovens, stoves, hearths) and their actual number is unknown.

Based on surveys conducted by the Tallinn University of Technology heat technology institute from 1999–2009, it has been found that the average number of hearths in one-family homes, farm buildings and apartments with wood-burning-stove heating is 3. **Thus the estimated total number of hearths could be 600,000.**[29] The average result found in the surveys was that Estonia burns close to 2.3 million cubic metres – 4.6 TWh worth – of wood fuels per year in small heating elements, which totals about 150 kWh/m^2 per year.

In addition to existing spot and local heating systems, heat pumps have been installed over the last 18 years, some of them also sole heating sources. The relatively inexpensive and easy to install air-source heat pumps are more common, but the share of geothermal heat pumps is also growing. The latter are especially popular in areas where large registered immovable properties allow primary heating loops to be installed.

According to the Estonian Heat Pump Association data, **approximately 47,500 heat pumps have been installed in Estonia between 1993-2010:**

- of these, close to 41,500 are air source heat pumps, that is, air-water and ventilation air-heat pumps and
- close to 6,000 are geothermal pumps.

The total capacity of heat pumps installed in Estonia is an estimated 275 MW.[30]

[28] Statistics on renewable energy. MTÜ Eesti Taastuvenergia Koda. http://www.taastuvenergeetika.ee/statistika/

[29] Ülo Kask. Wood fuel and its share in the Estonian energy balance. Master's thesis. Tallinn: Tallinn University of Technology, 2001.

[30] Data on heat pumps installed in Estonia. Eesti Soojuspumba Liit. http://www.soojuspumbaliit.ee/upload/editor/files/soojuspumpade_kasutuselevotu_dynaamika_Eestis _2010%281%29.pdf

Small **electric wind turbines** are installed primarily in rural areas where wind conditions are better. Their number in Estonia is estimated as under 50 devices.[31] There are about 10 rural dwellings in Estonia that use small equipment to transform hydro energy to electricity.

In recent years, **solar collectors** for producing hot household water have started to be installed in apartment buildings, private homes as well as public buildings, even office buildings. The total number of such sites is estimated as being over 100. Solar (PV) panels are not in as widespread use primarily on Maritime Administration sites (lighthouses, seamarks), but interest in these is growing and a number of panels can already be seen on the roofs of private homes. Estonia's first PV panel solar park, with a capacity of 100 kW, will be completed in 2012 in Kurenurme village in Sõmerpalu municipality. The development of small electricity producers has thus far been hindered by very strict requirements and bureaucratic obstacles for connecting equipment to the distribution grid, but changes are expected in this area in the near future.

[31] General overview of the wind energy sector. http://www.tuuleenergia.ee/

6. Overview of education in the field of construction in Estonia

6.1. Construction education and training at the vocational education level

6.1.1. Description of the occupational qualifications system in the field of construction

To ensure the growth of Estonian workers' competitiveness and to develop, evaluate, recognize and compare professional competence, a national competence-based qualification system is being developed to map out the needs of the labour market, describe educational levels and results of study, and to promote mobility of learners. The **occupational qualifications system** is part of the qualification system.[1].

The state-established **Kutsekoda Foundation (Estonian Qualifications Authority)**[2] is in charge of the development of the occupational qualifications system**.** This system integrates the educational system with the job market and the following takes place in this framework:

- determining the competence expected on the job market;
- assessing the conformity of the applicant's actual competence and recognising their qualifications;
- maintaining the register of occupational qualifications.

The competence circle seen in figure 6.1 shows how the occupational qualifications system integrates the job market with the lifelong learning system (formal, non-formal and informal study) and sets out the components of the process and the links between them.

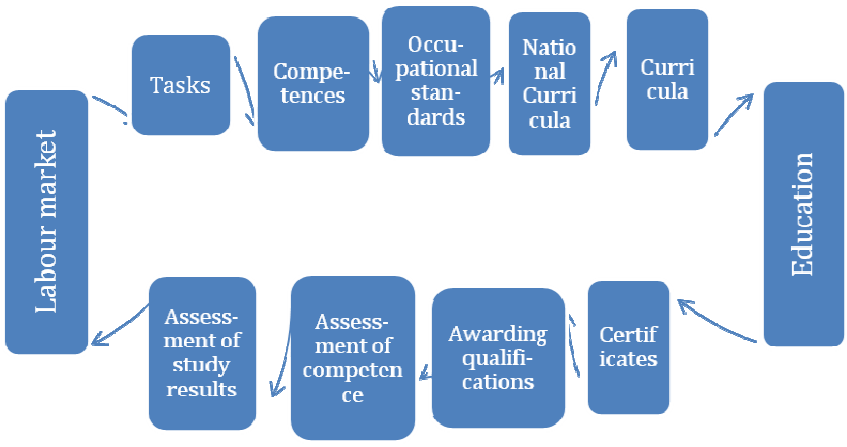


Figure 6.1. Competence circle (source: Estonian Qualifications Authority) [3]

[1] Development plan for the area of administration of the Ministry of Education and Research "Smart and industrious people", 2011–2014, p. 18.

[2] Estonian Qualifications Authority. http://www.kutsekoda.ee

[3] O.Aarna's presentation "Europe's single lifelong learning space and the Estonian occupational qualifications system". 09.12.2008. http://www.kutsekoda.ee/fwk/contenthelper/10216448/10216464

The Estonian Qualifications Authority's sector skills councils select bodies that award occupational qualifications pursuant to open competition procedure. Occupational qualifications committees operating at the awarding bodies decide on awarding qualifications, and form assessment committees for that purpose.

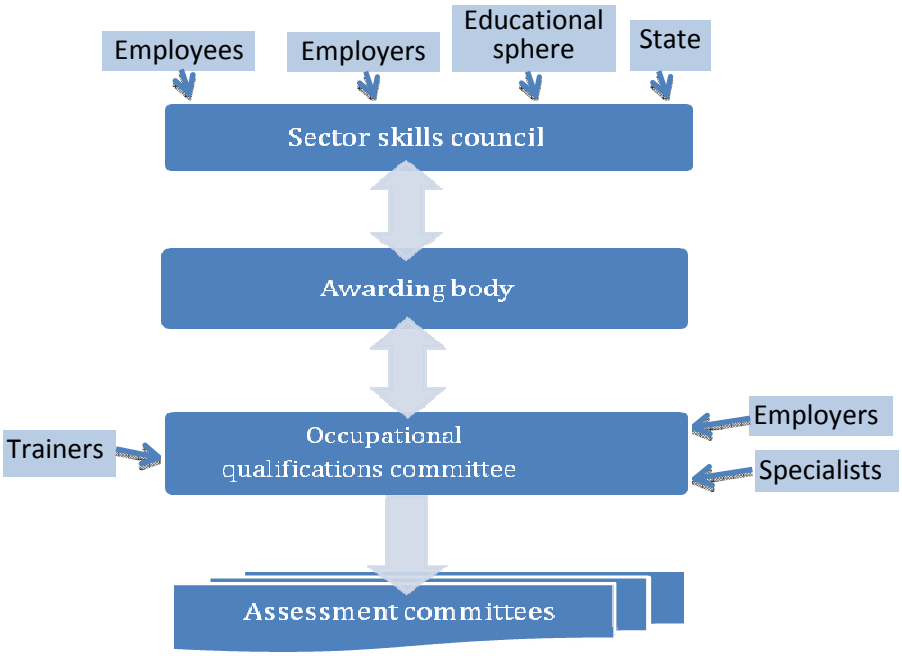


Figure 6.2. Parties in the competence circle (source: Estonian Qualifications Authority)

As of September 2008, Estonia has an **eight-level national qualifications framework** (EstQF)[4] that integrates educational and occupational qualifications. It is in conformity with the European Qualifications Framework (EQF). The descriptions of the EstQF levels are set forth in an annex to the Occupational Qualifications Act[5] and these specify the general requirements for academic results and occupational qualifications levels in the occupational qualifications system. The occupational qualifications – i.e. professions – fall into EstQF levels 2-8. The formal education qualifications fall into EstQF levels 3-5 (Annex 2).

To bring the competence of school graduates and employees into conformity with the requirements of the labour market, the occupational qualifications system determines the necessary competence for working successfully in various roles in the profession and a corresponding occupational standard is prepared for each one of them. The occupational standards are used to create possibilities for assessing competence; this is termed "awarding occupational qualifications". The competences described therein are the basis for organizing the corresponding training, in-service training and retraining. As of March 2012, 642 occupational standards for 326 professions have been established. Close to 66,200 occupational qualifications certificates and 302 competence certificates have been issued.

[4]. Kvalifikatsiooniraamistik. Kvalifikatsioonisüsteemi uue kontseptsiooni ja kvaliteeditagamise süsteemi väljatöötamine (Qualification framework. Conceptual grounds for developing the new qualification system strategy and quality assurance system), p. 12. Estonian Qualifications Authority. www.kutsekoda.ee/fwk/fb/10088731

[5] Professions Act, entered into force 1 September 2008. Text in English http://www.kutsekoda.ee/fwk/contenthelper/10445708/10445709

6.1.1. Awarding occupational qualifications in the field of construction

As of 2002, the Estonian Association of Construction Entrepreneurs is the body responsible for awarding occupational qualifications to skilled workers in the field of construction. The skilled worker occupational qualification examination can be taken in the following occupations: construction finishing specialist (tile installer, plasterer, painter, flooring installer), carpenter, mason, plumber and ventilation technician. As of 2011, the non-profit organization MTÜ Eesti Pottsepad was added to the list as the awarder of occupational certification to potters.

The first time application and recertification of competence can vary in terms of preconditions and forms. In the case of first-level occupational qualifications, the forms for assessing competence are a written multiple choice test, written problem-solving and an oral examination. In the case of higher-level occupational qualifications, assessment of competences takes place on the basis of documents. Practical skills are not assessed on the qualification examination; it is considered substantiated solely on the basis of a description of occupational activity. The occupational qualifications committee shall make the decision to award or not to award the occupational qualifications on the basis of assessment results on a case-by-case basis for each applicant. An occupational qualifications certificate is awarded on the basis of the decision, and this is entered into the register of occupational qualifications.

In the field of construction, the number of applicants has seen a stable increase, above all due to first-level occupational qualifications seekers – primarily graduates of vocational educational institutions. Around 70% of the graduates of construction specialities at the vocational educational institution in a given year take the occupational qualification examination.

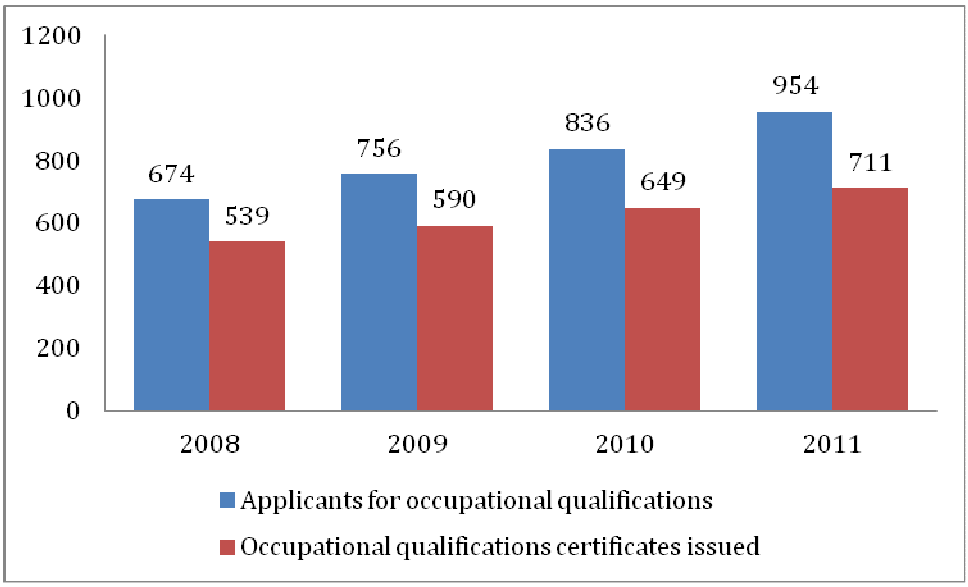


Figure 6.3. Number of applicants for occupational qualifications and occupational qualifications certificates issued in the field of construction 2008-2011[6]

In the period 2008–2011, first-level occupational qualifications were issued to 1,981 persons, of whom the predominant share received construction finishing specialist I and bricklayer occupational qualifications certification.[7] The number of those taking the examination for first-time certification as an environmental

[6] Extract from the Register of Occupational Qualifications as of 1 May 2012. http://www.kutsekoda.ee/et/kutseregister/kutsetunnistused

[7] The occupational qualification levels are shown in the old, five-level qualification framework. In the new, 8-level occupational qualifications framework, these first-level qualifications correspond to EstQF qualification level III.

technician is seeing an increase. The fact that most of the applicants for first-time certification are graduates of the relevant speciality at a vocational educational institution and have their examination costs paid by the state certainly plays a role in this.

Table 6.1. Dynamics characteristic of the number of first-level occupational qualification examination takers, 2008–2011

First-level occupational qualifications	2008	2009	2010	2011	Total
Carpenter I	3	3	31	20	**57**
Construction finishing specialist II	188	257	254	283	**982**
Bricklayer I	149	169	218	191	**727**
Potter I	0	0	0	8	**8**
Environmental technician I	16	14	20	40	**90**
Ventilation technician I	0	12	0	5	**17**
Total	**356**	**455**	**523**	**547**	**1881**

Occupational qualifications are not actively sought at higher levels of skilled workers in the field of construction (except for the construction manager profession). The reason for this may be seen as the fact that employers do not place enough value on occupational qualifications of employees; the employee must also pay his or her own costs in the process.

Table 6.2. Number of occupational qualifications awarded to skilled workers in the construction industry as of 1 May 2012[8]

Occupational area[9]	Valid occupational standards	Occupational qualifications level I	Occupational qualifications level II	Occupational qualifications level III
Construction management	Construction manager*			641
General construction	Concrete structure builder	–	–	1
	Finishers	1102	30	0
	Carpenter	61	6	2
	Log house builder	68	21	16
	Sheet metal worker	0	1	1
	Bricklayer	756	6	6
	Potter	8	54	63
	Potter-restorer	0	0	5
Environmental technology	Plumber	89	5	1
	Ventilation technician	17	11	0

*The occupational standard for construction manager envisions only qualifications level III.

In the field of engineering, seven different professional associations hold the right to award occupational qualifications; three of these are connected to building construction.[10] As of January 2012, a total of 1,253 occupational qualifications certificates have been issued for 34 occupational titles in this field. Three

[8] Extract from the Register of Occupational Qualifications as of 1 May 2012. http://www.kutsekoda.ee/et/kutseregister/kutsetunnistused

[9] The occupational area is assigned pursuant to the classification of occupations based on the International Standard Classification of Occupations 2008 (acronym ISCO).

[10] Estonian Association of Construction Engineers (http://www.ehitusinsener.ee), Estonian Association of Heating and Ventilation Engineers (http://www.ekvy.ee), Estonian Association of Heating Equipment Engineers Society (http://www.estis.ee).

awarders of occupational qualifications are connected with the field of building construction, and as of 1 January 2012 they had issued 849 occupational qualifications certificates at different occupational qualifications levels and titles.

Table 6.3. Number of valid engineering qualifications awarded in the construction industry as of 1 May 2012[11]

Awarder of qualifications	Valid occupational standards	Valid occupational certificates
Estonian Association of Civil Engineers	Construction engineer	178
	Statutory construction engineer	307
	Authorized construction engineer	92
Estonian Association of Heating and Ventilation Engineers	Energy auditor	50
	Statutory energy auditor	24
	Authorized energy auditor	6
	Issuer of energy labels for buildings	111
Estonian Association of Heat Equipment Engineers	Heating equipment engineer	2
	Statutory heating equipment engineer	28
	Authorized heating equipment engineer	51

The engineer's qualifications are based on knowledge and use of the technical equipment, technologies and systems in the speciality and the ability to control their operation and repair; the engineer must be conversant in the equipment, techniques and technologies and know how to apply the fundamental knowledge in the area.

The diploma engineer's qualifications are based on a thorough knowledge of theoretical fundamentals of the speciality, compared to the mere engineer's profession, it requires a creative ability in solving technical problems.

The chartered engineer is the highest-level diploma engineer in Estonia with special authority in the relevant field, his or her qualification is based on the ability to design new equipment and systems and/or to use scientific models and methods to solve problems in the field. In addition, the chartered engineer must be capable of managing projects and teams of people.

The occupational standards in the construction field are being revised in connection with the transition to the eight-level qualification framework, the existing standards will be updated and new ones will be added.. As the process is still ongoing, this is a good opportunity to determine the competences related to the energy efficiency of buildings in various occupational levels and to make proposals for updating the occupational standards. The point of departure is to what degree the given competence (knowledge, skills, attitudes) in the specific occupational standard may influence the energy efficiency of the building or of the construction process.

6.1.2. Structure of the vocational education system[12] and quality assurance system in Estonia

One of the strategic objectives in the Estonian vocational education system development plan for 2009–2013[13] is to ensure conformity of **initial training as well as in-service training and retraining to the needs of Estonia's economic development**.

[11] Extract from the Register of Occupational Qualifications as of 1 May 2012. http://www.kutsekoda.ee/et/kutseregister/kutsetunnistused

[12] **The vocational education system** is considered to be the institutions dealing with vocational education and the vocational educational and development activities taking place in these institutions at the basic and secondary education level and formal education or adult professional training.

[13] "Estonian vocational education system development plan 2009–2013" and "Implementation plan 2009–2011" were approved by Government of the Republic Order no. 386 of 11 September 2009, pp 5-14.

The most important function of vocational education and training (VET) is to create, through achieving professional and social competence, a basis allowing the student to be successful in his or her chosen occupation and to ensure that the student is prepared for further development in the occupational and lifelong learning.

Estonia has a total of 42 vocational educational institutions, and **construction specialities are taught in 19 schools**[14] located in different regions.

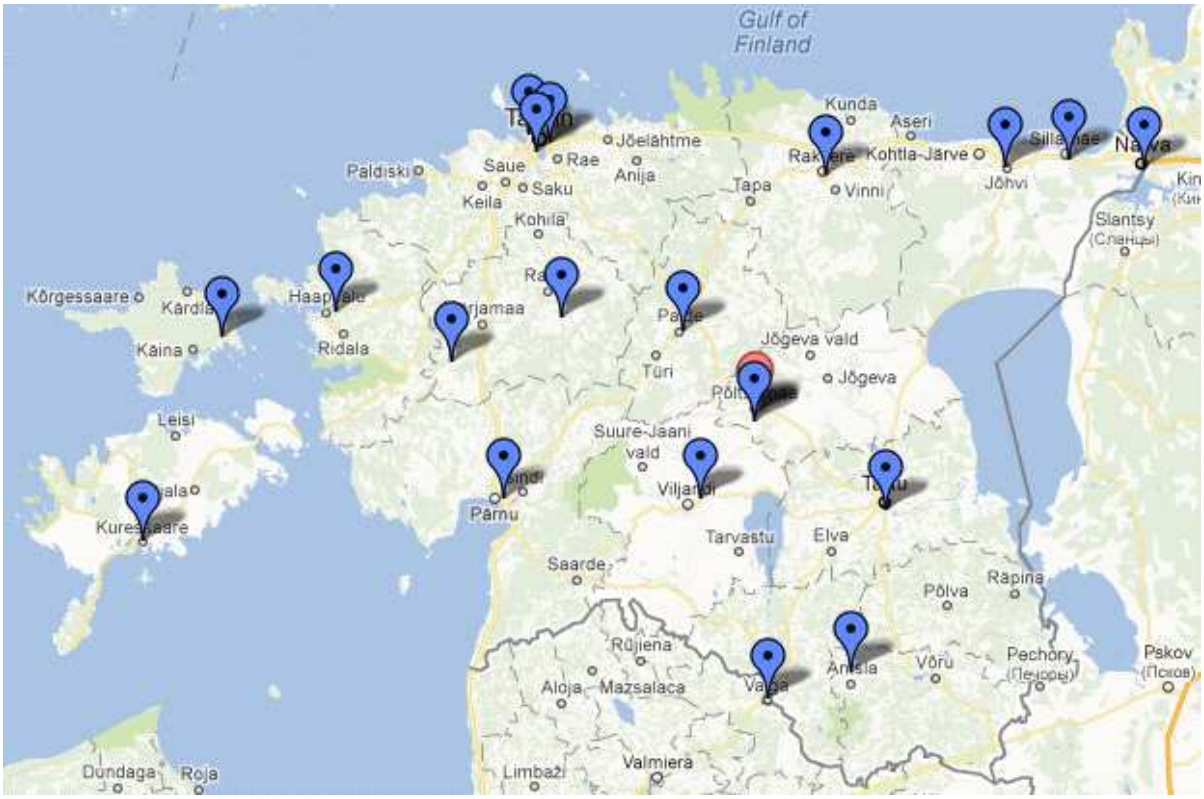


Figure 6.4. Locations of vocational schools that teach construction specialities

As of 10 November 2011, a total of 27,046 people studied at vocational educational institutions. That number has remained relatively stable (it was 27,239 in 2008). The field of vocational education with the largest number of students is technology, manufacturing and construction)[15], which also includes the construction and civil engineering works curriculum group. In the 2011/12 academic year, 10,976 students are studying there, which is 40 percent of all vocational students. At the same time, the number of students has decreased constantly in this field (see table 6.4).

[14] Haapsalu Vocational Education Centre, Hiiumaa Regional Training Centre, Ida-Viru County Vocational Education Centre, Järva County Vocational Education Centre, Kehtna Economics and Technology School, Kuressaare Regional Training Centre, Narva Vocational Education Centre, Põltsamaa Regional Training Centre, Pärnu County Vocational Education Centre, Rakvere Regional Training Centre, Sillamäe Training Centre, Tallinn Construction School, Tallinn Kopli Regional Training Centre, Tallinn Lasnamäe School of Mechanics, Tartu Vocational Education Centre, Valga County Vocational Education Centre, Vana-Antsla Kutsekeskkool, Vana-Vigala Technology and Service School, Viljandi Joint Vocational Secondary School.

[15] The 97 classifiers of the ISCED (International Standard of Classification of Education) are used to categorize specialities in vocational education. The ISCED is a single international standard for categorizing educational levels and curricula. Its purpose is to enable comparability of national educational systems and educational statistics. ISCED describes eight fields of study, which are divided into 24 areas of activity and 91 curriculum groups. Estonia offers vocational training in 33 curriculum groups.

Table 6.4. Changes in the number of students, by field of study, 2007/2008 – 2011/2012[16]

Field of study	2007/08	2008/09	2009/10	2010/11	2011/12
Education					
Humanities and the arts	1,016	1,080	1,225	1,295	1,380
Sciences	1,221	1,459	1,894	2,215	2,468
Agriculture	1,952	1,898	1,867	1,764	1,721
Social sciences, business and law	3,339	3,372	3,288	2,960	2,638
Service	6,183	6,337	7,088	7,162	7,003
Technology, manufacturing and construction	12,970	12,491	12,334	11,819	10,976
Health and welfare	700	602	667	797	860
Total	**27,381**	**27,239**	**28,363**	**28,012**	**27,046**

In connection with the economic downturn, the number of students in vocational education grew, but as of the 2011/2012 academic year it has once again fallen to the 2008/2009 level. Based on the Statistics Estonia's birth statistics and the trends to this point in vocational education, the number of students can be projected to decline in the years ahead. At the same time, the interest on the part of adults in acquiring a vocational education is growing.

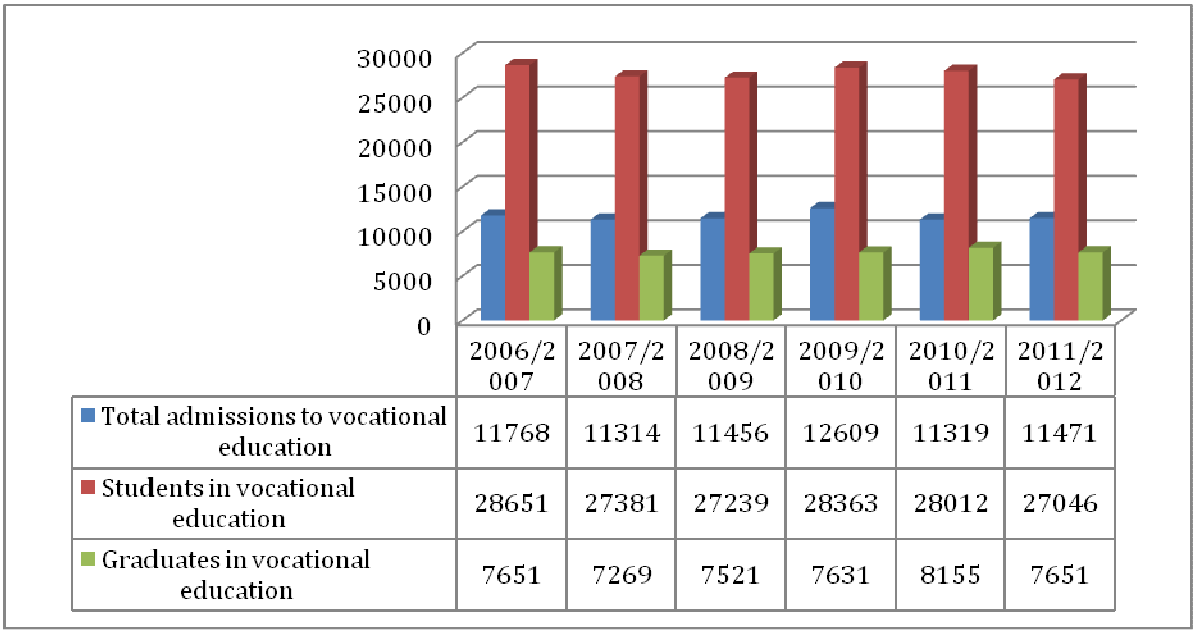
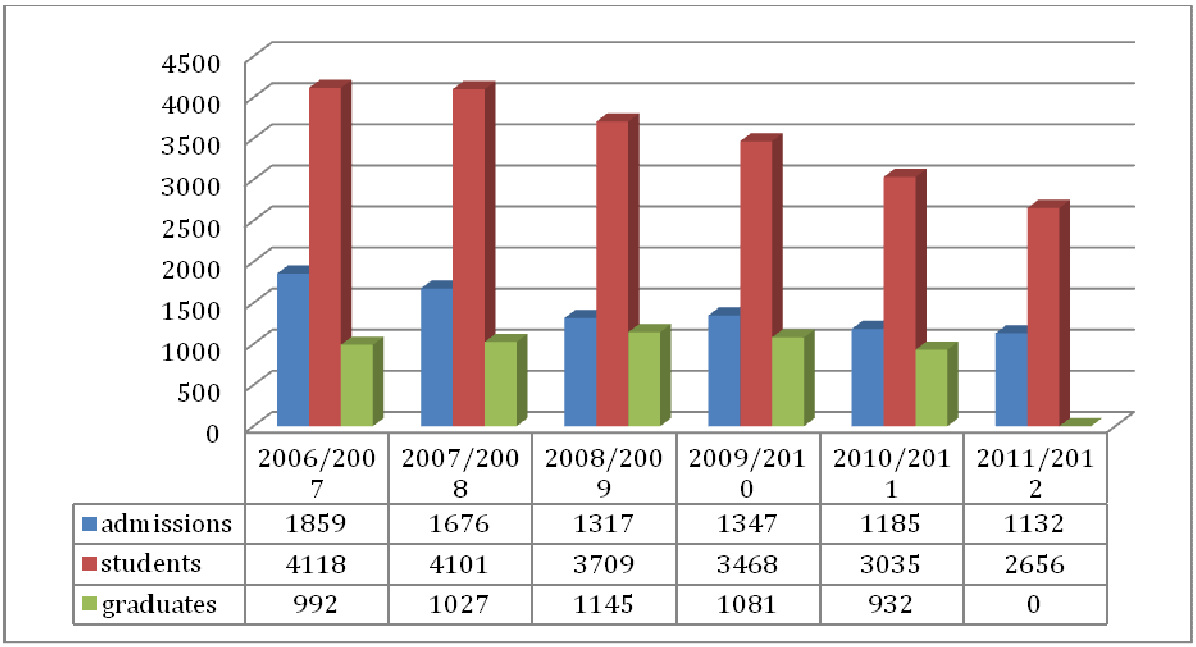


Figure 6.5. Dynamics characterizing number of admissions, number of students and graduates in vocational education in 2006/07 – 2011/12[17]

The general developments in regard to the decline in the number of students directly impact the **construction and civil engineering curriculum group**, which had the greatest number of students in 2006/2007 academic year – 4,118. Later on the number showed a decreasing trend and had dropped to 2,656 by the 2011/2012 academic year.

[16] Estonian Educational Information System (EEIS), 10 November 2007–10 November 2011.

[17] EEIS, extract from the Ministry of Education analysis division as of April 2012.



	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012
admissions	1859	1676	1317	1347	1185	1132
students	4118	4101	3709	3468	3035	2656
graduates	992	1027	1145	1081	932	0

Figure 6.6. Dynamics characterizing admissions, number of students and graduates in the construction and civil engineering works curriculum group in 2006/07–2011/12[18]

6.1.3. Ensuring the content and quality of vocational studies in vocational education

Starting in the 2008/09 academic year, students are accepted to schools only on the basis of curricula that conform to national curricula. **A national curriculum** is a document that determines the objectives and functions of vocational training, the requirements for starting study and graduating, the curricular modules and their number of credit points, along with brief descriptions, possibilities and conditions for selecting modules and options for specialization. The preparation of national curricula is entrusted to working groups consisting of specialists and teachers of the occupational area. Thanks to close cooperation with schools and social partners on various levels, the national curricula are ensured to be of practical real-life value and applicable.

The implementation of national curricula has contributed to standardizing the quality of vocational study. The fact that vocational education is now subject to unified nationwide standards has helped ensure that students have equal opportunities in each school and in each region for entering the open job market. The representatives of schools also see the changes as positive.[19]

[18] EEIS, extract from the Ministry of Education analysis division as of April 2012.

[19] "Utilization of national curricula in vocational educational institutions". Klaris Uuringud OÜ, 2011.

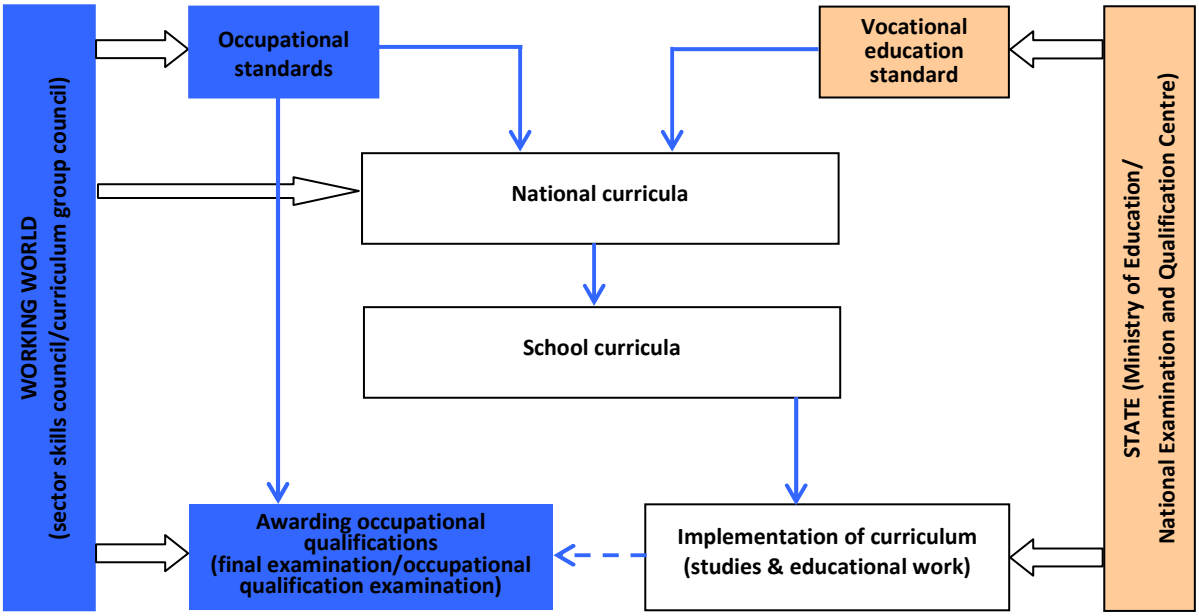


Figure 6.7. Preparation of curricula in vocational education[20]

The basis for vocational education is the "**National curriculum for construction specialities**"[21], which on the basis of the ISCED 97 classification is part of the construction and civil engineering works curriculum group and **specifies the volume of vocational study and compulsory content as well as requirements for starting and completing study**. The volume of vocational studies is based on the objectives and content of the instruction of vocational education, and is counted in weeks of study (40 hours of work done by the student) where the volume of one year of study is at least 40 weeks of study. In construction specialities, the basis for developing compulsory content of vocational study is the occupational skills requirements established by the occupational standards approved by the sector skills council on construction, real estate and geomatics. The compulsory study content is set forth as modules that specify the knowledge, skills and values, in conformity with professional skills requirements; in the national curriculum the brief descriptions of the modules are presented based on study output.

The national curriculum in construction specialities determines vocational training in the following specialities:

1) mason;
2) finishing work in construction;
3) carpenter;
4) plumber;
5) restorer of wood and stone buildings;
6) facility service person;
7) road construction;
8) land improvement and hydrotechnics.

The most popular specialities in terms of number of students are finishing work in construction, mason and restorer of wood and stone buildings.

[20] Accreditation concept, annex 1. Estonian Higher Education Quality Agency, 2010. http://ekka.archimedes.ee/dokumendid

[21] Minister of Education and Research Regulation no. 20 of 14 March 2008 enacted thereunder, "National curriculum for construction specialities"; https://www.riigiteataja.ee/akt/12940025

Table 6.5. Construction specialities, number of schools and students in 2011/2012 academic year[22]

National curriculum	Schools	Students as of 1 November 2011
Finishing work in construction	12	899
Carpenter	8	224
Plumber	5	209
Facility service person	4	172
Mason	12	670
Restorer of wood and stone buildings	7	324
Road construction	1	140
Land improvement and hydrotechnics	1	18
General construction*	3	4

*Admissions to this speciality have ended.

The total volume of vocational study is 80 weeks of study (3,200 hours): Joint commom courses in all specialities take place for 19 weeks of study[23], core study in the speciality take place in for 44 weeks of study[24] (including **minimum practicum of 22 weeks of study, i.e. 880 hours)** and the curricula contain 17 weeks of study of optional study modules[25].

The topics of energy conservation and building energy efficiency are not directly covered in the national curriculum. Indirect references can be found in the general study modules "Occupational and environmental safety" and "Fundamentals of renovation". Study at schools takes place according to the school curriculum prepared on the basis of the national curriculum, where the study content for achieving the study results set forth in the national curriculum is provided. Thus there is no overview of how much and what topics related to energy conservation and energy efficiency are dealt with during study. That is why cooperation with higher educational institutions is very important for promoting the field, as is preparing textbooks and guidelines and developing study methodology.

To complete a study programme, the study results set forth in the curriculum must be achieved and a final examination in the speciality must be passed. **Graduates of vocational educational institutions have the right to take the relevant occupational qualification examination instead of the final examination in the speciality.** Those taking the occupational qualification examination are awarded a first-level occupational qualifications certificate.[26] The costs of an occupational qualification examination taken in lieu of a speciality final examination are covered from the state budget.

The most important specialities in the context of energy efficiency and the occupational qualifications acquired after passing the first-level occupational qualification examination are shown in table 6.6.

[22] EEIS, extract January 2012.

[23] In accordance with Subsection 7 (6) of Government of the Republic regulation no. 90 of 6 April 2006, the study content of specialities shall be described in one national curriculum if at least 25% of the general and core study modules in one curriculum group in these specialities are the same. Common general and core study broaden schools' opportunities in organizing educational work, allowing students to switch to a different speciality if necessary. General educational subjects are integrated with general or core study modules in an extent and array necessary for acquiring the relevant profession or speciality.

[24] **The core study modules** determine the sets of knowledge and skills necessary for operating in the profession, speciality or occupation.

[25] The elective study modules define the knowledge and skills that support and broaden professional skills or are connected to additional qualifications. In construction specialities, the volume of elective study makes up 21 percent of the total vocational study volume. The elective study modules are prepared by the school.

[26] Occupational qualification is substantiated by a qualifications certificate. The holder of a qualifications certificate has the right to use the occupational title stemming from the occupational area or its abbreviation. The issuer shall register the qualifications certificates and they shall be entered into the Register of Occupational Qualifications in accordance with the Statutes of the Register of Occupational Qualifications. There is a fee for taking the qualification examination.

Table 6.6. Curricula in the specialities and occupational qualifications awarded upon completing the studies

Curriculum in the speciality	Occupational qualifications
Mason	Bricklayer
Finishing work in construction	Finisher
Carpenter	Carpenter
Plumber	Plumber (including ventilation technician)
Facility service person	Facility service person

The number of applicants for occupational qualifications among school graduates has grown each year: there were 356 of them in 2008, and 1,925 in 2011. Schools say the reason is that teachers support the taking of the occupational qualification examination and students also see value in the examination, as it confers an advantage in landing a job.[27]

Table 6.7. Share of those taking the occupational qualification examination, percentage of the total number of graduates[28]

	2008/09	2009/10	2010/11
Total, all curriculum groups	30.9	31.3	39.3
Construction and civil engineering works curriculum group	40.0	43.5	56.2

Schools are obliged to monitor the **further progress made by graduates, gathering data** (mainly through electronic surveys) **6 months after graduation.** The data on graduates in the period from 2008/2009 to 2010/2011 have been corrected: persons for whom no feedback is available were omitted. Close to 64% of graduates in vocational education as a whole have started work either their own or a different speciality, hiring is an increasing trend. The general trends in vocational education are also seen in the case of graduates of the construction and civil engineering works curriculum group, of whom 64% found employment on the job market. Compared to those who graduated in the years of the economic downturn, the number of those who are working in their speciality or a similar field has risen by 16%.

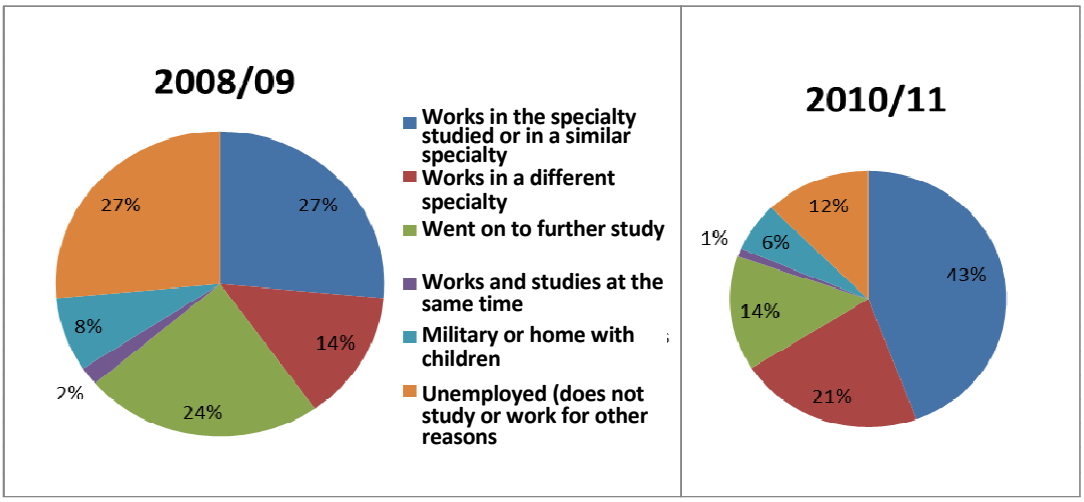


Figure 6.8. Analysis of hiring of graduates of the **construction and civil engineering works curriculum group** (percentage of the total number of graduates by year of study)[29]

[27] "Utilization of national curricula in vocational educational institutions". Klaris Uuringud OÜ, 2011.

[28] EEIS, extract from the Ministry of Education analysis division as of 4 April 2012.

[29]. EEIS, extract from the Ministry of Education analysis division as of 4 April 2012.

The share of youths who continue their educational path after graduating from school – mainly in professional higher education – is also relatively high. In the last five years, schools that teach construction specialities have worked closely with Tallinn University of Applied Sciences[30], where value is ascribed to young people with speciality training who become employees on the site manager level after they complete higher education.

6.1.4. Quality assurance system in vocational training

Quality was the main theme in the Estonian vocational education system development plans for 2005–2008 and 2009–2013. Development of the quality assurance system and implementation of quality control principles at both the national and school level has been a central concern. Regular in-house evaluations of vocational educational institutions has been made a legislative requirement, a system of publicly available criteria for vocational education has been established, and a competency model for vocational educational institution directors has been developed.[31] To acquire international experience, Estonian representatives are active in the work of the European vocational education quality assurance network[32].

National certification and the underlying process of accreditation are one part of the quality control model in vocational education, which includes various in-house evaluation and external evaluation means.

The development and implementation of the national recognition (hereinafter accreditation) system is financed from the budgetary funds of the European Social Fund (ESF)'s "Development of vocational education 2008-2013" programme. The activities are coordinated by the Estonian Higher Education Quality Agency (EKKA).[33] The main emphasis in accreditation is on the educational process.

Table 6.8. Means for internal and external evaluation of vocational education[34]

Evaluation means	Evaluation object
Audit	Financial area/individual activities
Supervision	Documents
Training permits/registration of curricula	Individual curriculum
Quality award model	School as an organization
Internal evaluation	School as a whole
Accreditation	Curriculum group

[30] Tallinn University of Applied Sciences is an institution of professional higher education, whose admission rules state that graduates of specialities of vocational educational institution vie for daytime study for state budget funded student places on the basis of rankings separately compiled on the basis of grades on graduation certificates. The state-funded places make up a maximum of 20% of the student places.

[31] "Vocational educational system development plan 2009–2013", p. 10. Ministry of Education and Research, 2009, http://www.hm.ee/index.php?03236

[32] European Quality Assurance Reference Framework (EQARF) and the European Quality Assurance Framework for Vocational Educational and Training (EQA-VET).

[33] The Estonian Higher Education Quality Agency EKKA is part of the structure of the Archimedes Foundation, is independent in its assessments and is entered into the European Quality Assurance Register for Higher Education. For more detail, see http://www.ekka.archimedes.ee/kutsekoolile

[34] Summary from the vocational education curriculum group accreditation pilot round. The Estonian Higher Education Quality Agency EKKA 2012, p 5.

Accreditation is performed on the basis of the curriculum group, focusing on implementation of the curriculum, methodological bases of study, the student's development, development of the curricula and study process and quality and sustainability of results. Upon accreditation, evaluation is performed both in a current and prospective view. The current view gives information on how the educational work is proceeding, including whether required study results are being achieved in the curriculum group. The goal of the development view is to gain information on the sustainability of the curriculum group.

Accreditation of curriculum groups is one stage in the chain of national certification, beginning with internal evaluation at the educational institution and ending with the issuing of a directive by the Minister of Education and Research, where the right to carry out study in a specific curriculum group is given.[35]

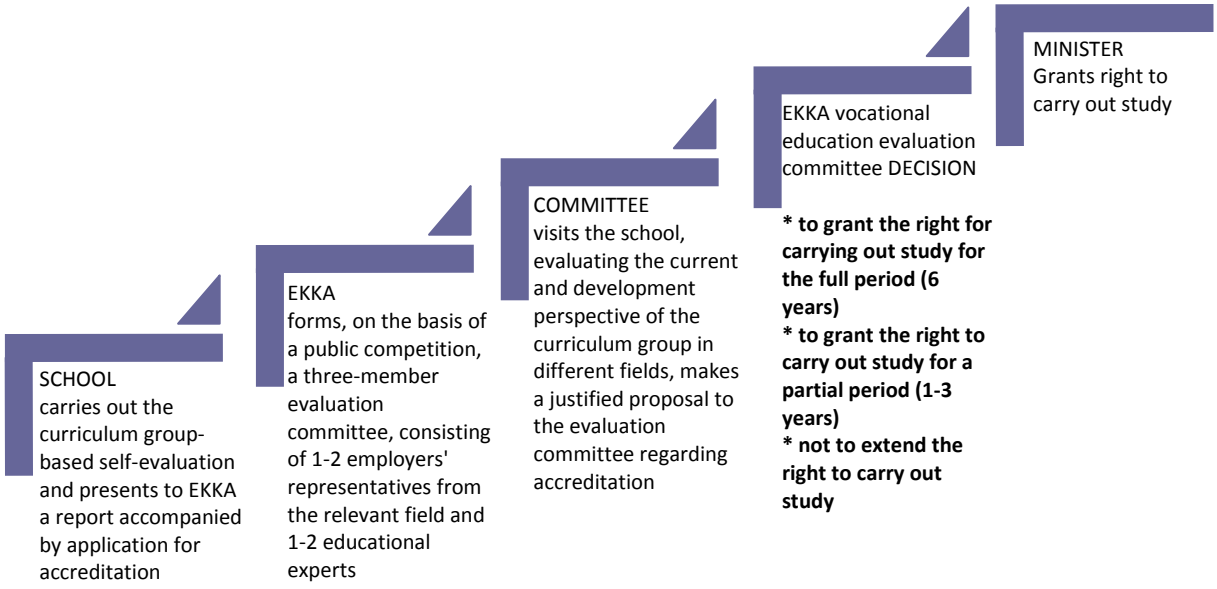


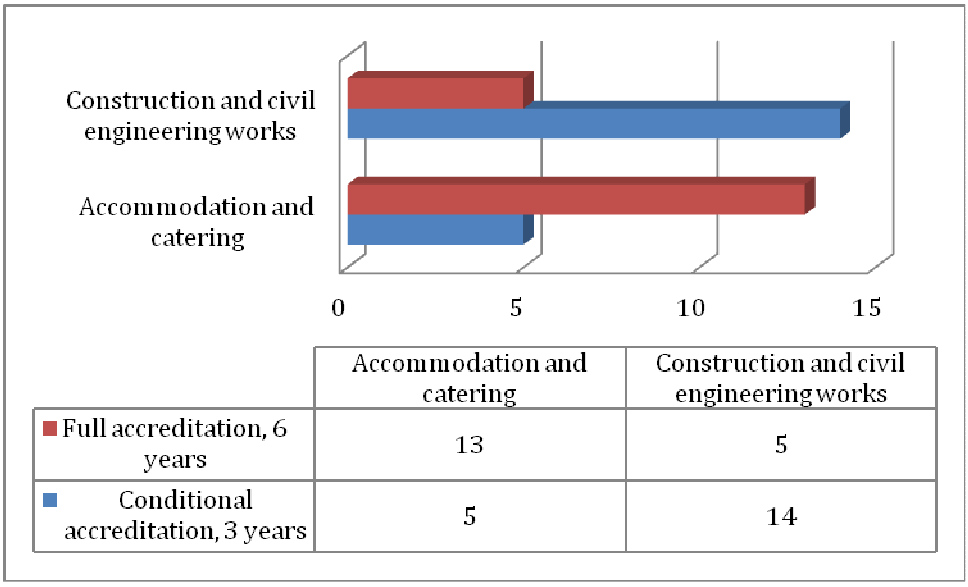
Figure 6.9. Accreditation system

The outcome of accreditation is that school operators and schools receive feedback for planning development activities (including for planning in-service training for administrators and teachers), planning of funds for investment and development, determining and using state-commissioned education.

In 2011, an **accreditation pilot round** was held in two larger curriculum groups – accommodation and catering and **construction and civil engineering works.** In the latter, all of the schools that offer construction specialities passed accreditation (19 of them).

The right to carry out study for the full period (6 years) was given to five schools. The share of schools that received partial, three-year accreditation was over twice as high as that in the accommodation and catering curriculum group. These schools may re-apply for state certification in 2014.

[35] Summary from the vocational education curriculum group accreditation pilot round. The Estonian Higher Education Quality Agency 2012, p 3. http://ekka.archimedes.ee/uudised



	Accommodation and catering	Construction and civil engineering works
Full accreditation, 6 years	13	5
Conditional accreditation, 3 years	5	14

Figure 6.10. Accreditation pilot round results for curriculum groups[36]

6.1.5. Professional competence of vocational teachers

Since the 2009/10 academic year, it has been possible to integrate data on vocational teachers with the construction and civil engineering works curriculum group**.** According to the EEIS, there were **223 teachers in modules/subjects belonging to the construction and civil engineering works curriculum group**, which makes up close to 16 percent of the total number of vocational teachers in Estonia. Of these, **close to 70 teachers were directly related to vocational and speciality training.**

A single set of qualification requirements are in effect for all Estonian vocational teachers,[37] these define the necessary educational level, work experience and vocational teacher training requirements for working as a teacher. According to EEIS data, of the 223 vocational teachers in the construction and civil engineering works curriculum group 78%[38] conform to the qualification requirements, (Estonian average 83%), which is 3% higher than for teachers' qualification requirements. On the basis of the data in the EEIS, it is not possible to distinguish the numbers of teachers with engineering or technical education or the number of teachers with work experience in this field.

The average age of vocational teachers in the construction and civil engineering works curriculum group is 50.4 years – 3.4 years more than the Estonian average. As a general trend, there is a dearth of young teachers at all levels of study, including vocational education, where just 5.1% are young teachers who meet the qualification requirements.[39] Teachers under 25 account for just 2.6% of teachers in the construction and civil engineering works curriculum group. Certainly this demographic structure points to

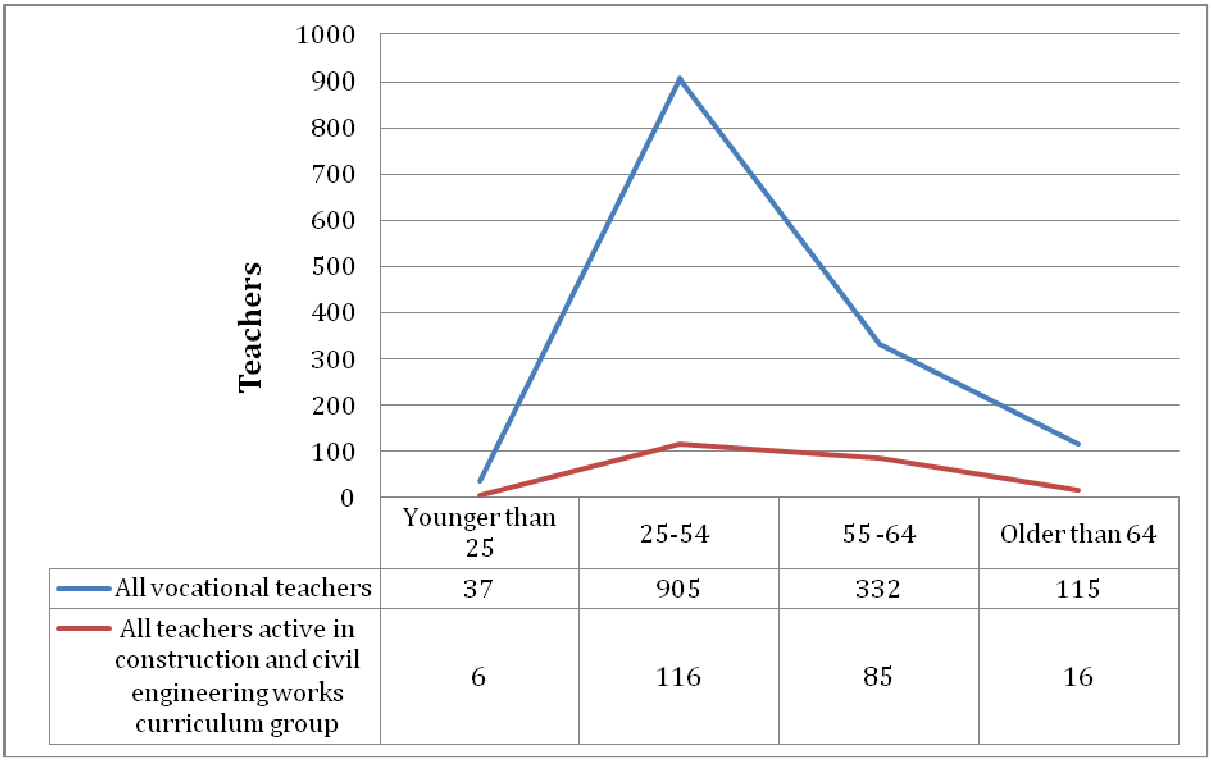
[36] Ministry of Education and Research, summary of the pilot accreditation.

[37] The qualification requirements were established by Section 26 of Minister of Education and Research regulation "Teacher qualification requirements" https://www.riigiteataja.ee/akt/13363346

[38] In accordance with the aforementioned regulation, at least 75% of the vocational teachers at a vocational educational institution must conform to the teacher qualification requirements.

[39] The "Smart and industrious people" strategy, p 14.

problems with training new teachers and jeopardizes sustainability of speciality training and the conformity of study to what the economy and labour market need.



	Younger than 25	25-54	55-64	Older than 64
All vocational teachers	37	905	332	115
All teachers active in construction and civil engineering works curriculum group	6	116	85	16

Figure 6.11. Distribution of vocational teachers by age[40]

Seventeen per cent of teachers speak Russian as their native language. These are predominantly teachers in schools in Ida-Viru County. Due to the language barrier, participation at specialized in-service trainings and vocational teachers' network operations is often rendered more complicated.

6.1.6. Participation of vocational teachers in development work and networks of speciality teachers

Speciality networks of vocational teachers were created in 2005 through the ESF projects "Training of vocational teachers and developing an in-service training system" and "Vocational educational institution curriculum development". Creating, developing and supporting networks will continue in the framework of this programme, "Development of the content of vocational education 2008–2013". All of the vocational teachers from the relevant field are involved in the network.

The network of vocational teachers in construction specialities has been in operation since 2007. The network's mainly two-day seminars take place twice a year. The goal of the seminars is to offer information on developments in the field and to make cooperation between the vocational teachers in the construction speciality more effective. Close to 60 percent of the field's vocational teachers participate at the seminars. The topics dealt with at the seminars may notionally be split into four major groups:

- developments in vocational education in Estonia and abroad;
- overview of developments in the vocational system, including aspects related to the vocational examination;
- study materials that support implementation of the national curriculum;

[40] EEIS, extract.

- sharing international experience (those who participated in academic migration projects talk about their experiences, talk about the result and experiences from European and world vocational championships EuroSkills and WorldSkills).

In addition to network seminars, **professional in-service training courses** are held for vocational teachers in accordance with the ESF program, "Development of the content of vocational education 2008–2013". The goal of the professional in-service training courses is to enable vocational teachers to develop existing knowledge and acquire new knowledge, skills and methodological techniques for academic work in different thematic fields. From 2008-2012, 14 training sessions have taken place in the following thematic fields:

- finishing work in damp rooms;
- hydroinsulation and tiling;
- decorative finishing;
- construction surveying (introductory course);
- construction surveying (continuation course);
- concrete work (2 groups);
- fundamentals of real estate management;
- **construction and work of heat pumps, operation of refrigerants**;
- installation of insulation compound systems (2 groups);
- **energy conservation and building energy efficiency;**
- installation of roofing (2 groups).

The average number of days for which vocational teachers in the construction and civil engineering works curriculum group participated in in-service training has risen from 9 to 13 days, which is 10% more than the average participation rate for vocational teachers in Estonia.

Table 6.9. Participation in in-service training (days)

Academic year	Overall participation rate	Construction and civil engineering works curriculum group
2008/09	8.7	9.1
2009/10	9.8	11.6
2010/11	12	13.4

Various project financing has aided the broadening of training opportunities. Teachers also have good access to training offered to companies for introducing construction materials or technologies.

The large workload of vocational teachers can be cited as a deepening problem. Being engaged not only in the main work in first-level vocational training but also in preparing and carrying out adult in-service and retraining courses has led to a situation where schools do not want to allow teachers to take specialised in-service training and as a result the actual qualifications of vocational teachers is falling behind the rapidly developing employment world.

The **academic migration projects** financed from the Leonardo da Vinci programme are contributing to the updating of vocational teachers' knowledge and skills**.** The central projects aimed at vocational teachers were prepared in cooperation between the Association of Construction Entrepreneurs, National Examination and Qualification Centre and Addenda OÜ.

Table 6.10. Targets and themes of study migration projects held in 2009–2012

Year	Duration in days	Destination	Topics dealt with	Participants
2009	7	Berlin, Germany	Buildings conforming to passive building standards, professional placement in companies, dual system in vocational training.	16
2010	10	Tampere, Finland	Construction of concrete structures, construction of wooden buildings. Construction and practice of prefab panel buildings.	19
2011	7	Oslo, Norway	Norwegian vocational training system cooperation between vocational schools and construction companies, networks. Energy-efficient construction and renovation Energy-efficient construction materials and their use in construction.	19
2012	7	Copenhagen, Denmark	Danish vocational training system, projects held in construction vocational school and funding for them. Sustainable and energy-efficient construction, new technologies in construction, establishing energy-efficient high-rise buildings.	10

6.1.7. Funding for vocational training

Funding of educational institutions depends on their chain of command relations. In Estonia, there are state, local government and private educational institutions operating. Schools that teach construction specialities are primarily state-run vocational educational institutions, and two are municipal. There are no private vocational educational institutions. State and municipal vocational educational institutions receive funding from the state budget to cover operating costs and investments.[41]

The basis for planning state commissioning of education at vocational educational institutions (hereinafter SCE) in both formal education and work-related training for adults is the Ministry of Economic Affairs' employment forecast, released each year with a 6-7-year perspective. Key partner organizations are actively involved in the process of SCE – employers' and employees' umbrella organizations and vocational and professional associations. To ensure a flexible response, the data from the Unemployment Insurance Fund on changes to the employment structure are also taken into account. In addition, the Estonian forecast is updated also relying on the European employment needs up to 2020 as projected by the European Centre for the Development of Vocational Training.

[41] Financing of student places from SCE can be applied for by privately owned vocational educational institution as well. In addition, income can be earned from provision of paid services related to the school's main area of activity, and other sources of financing may be used (e.g. targeted and project-based allocations etc) Section 33 of Vocational Education Institutions Act. https://www.riigiteataja.ee/akt/108072011009

In 2005–2008, the vocational education SCE rose the most in the industry and manufacturing and the service curriculum groups, where demand for qualified labour was very high. In the years that followed, these were in a declining trend. Starting in 2007, the number of student places in the in the curriculum group ordered by vocational educational institutions is approved for the subsequent three calendar years.[42] In addition to formal education, **the state commissions,** as of 2007, study places for adult professional in-service training, with support from the ESF.[43]

In the **construction and civil engineering works** curriculum group, SCE has remained stable in 2009-2011, although a small decline took place overall. Comparable data regarding fulfilment of RCT can be provided starting in 2009, with the share of filled student places in the total number of student places allocated by SCE. Up to 2008, SCE was calculated on a different basis and is not suitable for getting a comparative overview.

Table 6.11. Percentage of filled student places out of the total number of places allocated with SCE[44]

Field	2009	2010	2011
Total, all curriculum groups			
total number of student places	12 485	11 230	11 494
actually filled	101,3%	100,8%	99,8%
Construction and civil engineering works curriculum group			
total number of student places	1460	1275	1228
actually filled	92.3%	92.9%	92.2%

For every budget year, the cabinet by regulation establishes the **basic cost of a student place**[45], which has remained the same for the last three years. The basic cost in 2012 is 1,262 euros, to which the coefficient of 1.5 is added for construction and civil engineering works curriculum group[46]. Considering the share of practical instruction in the construction field and the high requirements for supply of materials and tools, the state funds are not enough to implement the curriculum at the level expected by employers.

[42] Procedure for preparing SCE was approved in 2007 by Minister of Education and Research regulation no. 1 of 11 January 2010.

[43] ESF programme, "Increasing supply of qualified workforce".

[44] EEIS, extract from the Ministry of Education analysis division as of 4 April 2012.

[45] Government of the Republic Regulation no. 6 of 27 January 2012, "Basic cost of a vocational educational institution student place in 2012", https://www.riigiteataja.ee/akt/130012012005

[46] Coefficients for curriculum groups and study formats and coefficients for financing study for students with special needs and prisoners are between 1–4 and are established by Government of the Republic Regulation no. 42 adopted on 9 February 2006.

6.2. Construction education at the university level

6.2.1. Description of the Estonian higher educational system

Higher education in Estonia is available in institutions of higher education that have the right to issue nationally-approved certificates of education (diplomas).[47] Universities' forms of study are bachelor's, master's and doctoral study and professional higher education, primarily in colleges operated by universities. The institutions of professional higher education provide a professional higher education, and master's degree programs can be offered in cooperation with universities. At some vocational educational institutions, it is possible to acquire a professional higher education. As of 16 February 2012, 30 educational institutions provide a higher education, including six public universities, 1 private university, 10 national institutions of professional higher education, 11 privately owned institutions of professional higher education and 2 national vocational educational institutions.[48]

In the sense of educational level, the first tier of higher education is the bachelor's degree and professional higher education, they are distinguished by the greater share of practical study and practicum work in the professional higher education curricula. Both types of curricula entitle the graduate to go on to the second stage of higher education, master's degree study, on condition that the admission conditions for the university or professional higher education institution are met. Completing the integrated bachelor's and master's degree curricula also confers a master's degree. Integrated bachelor's and master's study include both basic study and intensified specialization. One-level integrated study is offered in medicine, veterinary medicine, pharmacy, dentistry, architecture and construction engineering as well as elementary school teacher training. The third tier of higher education is doctoral study, which only universities have the right to teach. The goal of doctoral study is to confer the knowledge and skills necessary for independent research, development or professional creative work. The condition for admissions to doctoral study is a master's degree or the equivalent qualification.

Three public universities offer a higher **education in the construction and architecture**: the Estonian Academy of Arts, the Estonian University of Life Sciences, and the Tallinn University of Technology. In addition, it is possible to study at the professional higher education level at the Tallinn University of Applied Sciences.

Starting in the 2002/2003 academic year, the higher educational system is three-tiered, following the European higher educational system model of bachelor's-master's-doctorate.[49] Table 6.12 characterizes the levels of higher education and shows which levels, specialities and educational institutions in Estonia offer construction and architecture educations.

The amount of study is measured in credit points at all higher education levels of study. Starting in the 2009/2010 academic year, the European Credit Transfer and Accumulation System, ECTS is in national use. One credit point (ECP) equals 26 hours that the student has spent on study. The amount of study in an academic year is 1,560 hours, which is 60 ECP. One of the characteristics of an output-based curriculum is modular structure. In selecting modules, the university student specializes in the main speciality and, if necessary one or more secondary specialities. The necessary modules for specialization in a given speciality are offered to the student by the educational institution. The final selection of modules is made by the student.

[47] Estonian higher education strategy 2006-2015. https://www.riigiteataja.ee/akt/12752949.

[48] List of educational institutions as of 16 February 2012. http://www.hm.ee/index.php?046460

[49] Description of the Estonian higher educational system. http://www.hm.ee/index.php?046460

Table 6.12. Levels of the higher educational system and the specialities in the architecture and construction field at those levels[50]

<table>
<tr><td colspan="3">Doctoral study
180–240 ECP (3–4 years)[51]
Construction and environmental technology, TTÜ, 240 ECP
Technology, University of Life Sciences, 240 ECP</td></tr>
<tr><td rowspan="3">Integrated bachelor's and master's study
300-360 ECP (5-6 years)
Architecture and urban planning, Academy of Arts, 300 ECP.
Rural construction, University of Life Sciences, 300 ECP
Hydrotechnics, University of Life Sciences, 300 ECP
Industry and civil engineering, TTÜ, 300 ECP
Environmental technology, TTÜ, 300 EAP
Transport construction, TTÜ, 300 ECP</td><td colspan="2">Master's study 60–120 ECP (1–2 years)
Building energy efficiency / Industry and civil engineering / Environmental technology / Transport construction / urban construction and building design, TTÜ, 120 ECP
Landscape architecture, TTÜ Tartu College, 120 ECP
Architecture and urban planning, Academy of Arts, 120 ECP.
Land readjustment / Geodetics / Real estate planning, University of Life Sciences, 120 ECP</td></tr>
<tr><td>Bachelor's study
180–240 ECP (3–4 years)
Landscape architecture, TTÜ Tartu College, 180 EAP
Geomatics, University of Life Sciences, 180 ECP</td><td>Professional higher education study
180–270 ECP (3–4.5 years)
Building construction, TTÜ Virumaa College
Building construction / Road construction / Applied architecture, University of Applied Sciences, 240 ECP</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="3">Secondary education</td></tr>
</table>

In addition, there are a number of related areas at the level of higher education where the graduates are expected to begin employment in the field of building energy efficiency. For instance, with regard to electronics and automation field curricula, automation taught at Tallinn University of Technology at the bachelor's and professional higher education level; with regard to curricula in the field of art, heritage conservation and restoration taught at the bachelor's, master's and doctoral level at the Estonian Academy of Arts and the native construction curriculum taught at the University of Tartu Viljandi Culture Academy. Building energy efficiency also ties in with the real estate planning and administration subject taught at the University of Life Sciences and Tallinn University of Technology at the master's and bachelor's level.

As to employers, institutions of professional higher education have close cooperation with them, as the study in such educational institutions includes a large amount of practicum training and must consider the needs of the labour market. One novel way to integrate the labour market and training is the possibility of taking into account previous educational and work experience and involving, in the academic process as lecturers, practitioners with entrepreneurial experience.

6.2.2. Ensuring quality of study in higher education

In the previous system for ensuring quality of study, the national certification of diplomas depended on the accreditation of curricula. This was voluntary for institutions of higher education, but it is the only way to

[50] Estonian Educational Information System, register of curricula extract from specialities in the architecture and construction field of study (as of 11 April 2012. http://www.hm.ee/ehis/statistika.html

[51] Starting in the 2005/2006 academic year, educational statistics is prepared on the basis of data from the EEIS (basic education starting from the 2008/2009 academic year). The EEIS is a national register of data on the educational system. From 2001, the training areas from the more detailed ISCED (International Standard Classification of Education) from 1997 are in use.

get national certification for diplomas. A self-evaluation report was required as part of accreditation. This was followed by a visit by an international expert committee and an evaluation report.

From 2009, state supervision and quality evaluation are separate. The cabinet, by regulation (in the annex to the higher education standard), gives institutions of higher education the right to teach in a specific curriculum group and at a specific level (BA, MA, professional higher education, PhD) either for an unspecified term or for a term of up to three years). If an institution of higher education has received the right to teach, this is followed by a compulsory quality evaluation: institutional accreditation every seven years and a curriculum group quality evaluation. The evaluation authority at the higher education level is the independent Estonian Higher Education Quality Agency (EKKA). The function of this agency is to organize and carry out accreditation of education institutions and evaluate the quality of curriculum groups. Each individual curriculum is no longer evaluated in this new system, but rather curriculum groups (there are 28 groups). The primary instrument of quality assurance is institutional accreditation where the rating given to the internal quality assurance system and its functioning plays an important role.[52]

In the course of quality evaluation of curriculum groups the conformity of the curricula and the study taking place on the basis of them are assessed with regard to legal acts and international standards, along with the level of theoretical and practical studies, the qualification of teachers and research personnel and the sufficiency of study resources. As the outcome of the external evaluation, the Government of the Republic awards educational institutions the right to offer study programmes in the relevant curriculum group either for an unspecified term or for a term of one to three years. Positive accreditation decisions are valid in the case of seven years or three in the case of conditional accreditation.

During 2010–2011 the Estonian Higher Education Quality Agency organized a transition evaluation for all specialities in the architecture and construction area of activity. The results included both fixed-term, unspecified term decisions and ones that revoked the right to teach curriculum groups. The Estonian Academy of Arts lost its right to teach at the doctoral level, the main reason being the small number of PhD students and qualified supervisors. In granting the rights to offer study programmes for a specified term, emphasis was placed on the need to improve research topics and the interconnectedness of curricula as well as the amount of publications by supervisors, as well as the need to increase the number of regular speciality faculty members and to involve employers and professional associations in the curricular development.

Table 6.13. Accreditation results in the area of study of architecture and construction[53]

Educational institution	Educational level	Teaching rights
Estonian Academy of Arts	Doctoral study	Negative
	Master's study	Unspecified term
	Integrated bachelor's and master's study	Unspecified term
Estonian University of Life Sciences	Integrated bachelor's and master's study	Unspecified term
	Master's study	Unspecified term
	Bachelor's study	Unspecified term
Tallinn University of Technology	Doctoral study	Specified term
	Integrated bachelor's and master's study	Unspecified term
	Master's study	Unspecified term
	Bachelor's study	Unspecified term
	Professional higher education study	Specified term
Tallinn University of Applied Science	Professional higher education study	Specified term

[52] Ministry of Education and Research, description of quality evaluation systems. http://www.hm.ee/index.php?0511957, http://www.hm.ee/index.php?0511085

[53] Extract from the Estonian Higher Education Quality Agency database. https://wd.archimedes.ee/?page=pub_list_dynobj&desktop=10016&tid=414961

6.2.3. Funding of higher education

Higher education study is funded by the state through SCE, by private companies, or the students pay for non-state-budget places themselves. To a limited extent, costs of study are also covered by international scholarships.

The basis for approving state budget places is SCE, as a result of which education and training is partially regulated by the employment market. The relationship between study and future workplace is not regulated at the state level, thus workforce educated with state budget funding can end up being hired in another speciality or in another country. **The student places established on the basis of state-commissioned education are** filled pursuant to rankings of admissions results. In the last ten years SCE in the field of technology, manufacturing and construction has increased, while the volume of SCE has decreased. The field of construction on its own makes up one-third of SCE in the fields of technology, manufacturing and construction.

Table 6.14. SCE in the field of technology, manufacturing and construction by academic level (2003–2010)[54]

Educational level	2003	2004	2005	2006	2007	2008	2009	2010
Professional higher education study	697	714	697	663	722	703	656	650
Bachelor's study	582	650	651	701	669	669	702	705
Integrated bachelor's and master's study	150	156	156	157	157	161	163	163
Master's study	498	553	536	470	456	456	477	505
Doctoral study	33	31	30	35	34	44	43	42
Total in the field	1960	2104	2070	2026	2038	2033	2041	2065
Total SCE	9534	9652	9425	8922	9119	9146	9053	9067
Percentage in the field	21	22	22	23	22	22	23	23

The limits for non-state-budget student places are approved by the supervisory board of the institution of higher education. A person who did gain admission to a state budget funded student place has the right to begin studying, on the basis of a competition, in a non-state-budget student place within the said limits. The price of a non-state-budget student place is determined by the university, approving the price of a credit point in that field. For the most part, actual expenses are not the basis for the determination. The competitions in the field and competitive position in comparison to other university are viewed. For instance, the cost of credit points for non-state-budget student places in the economics and law specialities is many times higher than in science and technical specialities even though the share of practicum instruction and need for lab work are larger in technology fields and the costs are also higher.

In non-state-budget places, students mainly cover their tuition fees themselves; often with the help of a student loan or a job. The share of companies in covering the cost of credit points has been minor, as to this point compensation of expenses of formal education was subject to fringe benefit tax. This is no longer the case effective 1 January 2012, and thus hopefully companies will have more of a desire to pay for study. There is significant potential here for reducing the number of those who drop out of school and to increase the number of those who resume their study.

In summary, it can be said that there are quite abundant state budget places at all levels in the construction field, but the high number of those who drop out keeps the outcome indicators expected by the Ministry of Education and Research from being attained.

[54] Statistical overview of the field of higher education (October 2011), annex 5, p 46, 47 Ministry of Education and Research.. http://www.hm.ee/index.php?048183

6.2.4. Statistical data on higher education and higher education in the field of construction

Overall, in the 2011/2012 academic year there were 67,607 students studying toward a higher education, of which 31% were at the professional higher education level, 39% were in bachelor's study, 6% in integrated bachelor's and master's study, 19% in master's study and 5% in doctoral study.

Table 6.15. Aggregate indicators for higher education by academic level

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Students	68 767	68 168	68 399	68 985	69 113	67 607
Change compared to the previous academic year, %	0.7	–0.9	0.3	0.9	0.2	–2.2
At the level of professional higher education	22505	22938	23019	22544	21970	20791
In bachelor's study	29902	27932	27514	27533	27461	26571
Integrated bachelor's and master's study	3684	3853	4079	4160	4122	4024
Master's study	10534	11064	11322	12095	12632	13170
Doctoral study	2142	2381	2465	2653	2928	3051
Admissions	18 597	19 482	19 292	19 167	18 404	17 233
Change compared to the previous academic year, %	–5	5	–1	–1	–4	–6
Graduates	12 612	11 345	11 489	11 450	11 828	
Change compared to the previous academic year, %	9	–10	1	–0.3	3.3	
Dropped out	10 922	11 218	9 423	10 570	10 189	
Change compared to the previous academic year, %	21	3	–16	12.2	–3.6	

In the last four academic years, the number of those accepted to higher education has fallen, primarily due to a decline in the number of gymnasium graduates. At the same time, the overall number of those acquiring higher education has stayed stable thanks to the high number of master's degree and doctoral degree aspirants. Considering that the number of education institutions that provide higher education has dropped significantly (only one of five private universities is still in operation) the total number of higher education students is surprisingly stable. The continuing studying toward a master's degree is promoted by the transition to the 3+2 system, as specialized knowledge or specialist qualification cannot be acquired in just a three-year period of study. There are fewer aspirants for professional higher education: they accounted for 34% of the total number of university students in 2008, but this fell to 31 percent over three years.

The share of people with higher education among those aged 25–54 is more than the average in the EU member states (34.2 percent vs. 24 percent) and is under only the figure for Finland (36.6%). Yet there were only 11.4 graduates in sciences, technology, manufacturing and construction specialities per thousand people in the 25–54 age bracket, which is far under the results for most Scandinavian and Central European countries as well as under the average indicator of EU member states, 13.9.[55] The need for graduates of science specialities is growing continuously as their role in ensuring the state's economic competitiveness and importance in attracting companies that generate value added.

[55] Progress towards the common European objectives in education and training (2010/2011) – Indicators and benchmarks, data for 2008, pp 177–178. http://ec.europa.eu/education/lifelong-learning-policy/doc/report10/annexes_en.pdf

Table 6.16. Number of students by field of study[56]

Field of study	1995/ 96	1997/ 98	1999/ 00	2001/ 02	2003/ 04	2005/ 06	2007/ 08	2008/ 09	2009/ 10	2010/ 11
Education	3072	3726	4815	6389	6081	5182	4551	4787	4713	5133
Humanities and the arts	3768	4341	5848	6949	7362	7902	8281	8394	9403	9470
Social sciences, business and law	9883	12415	20254	23062	25031	26605	27393	27108	25112	23333
Sciences	2289	2920	3774	5537	6580	6860	6565	6495	7191	7712
Technology, manufacturing and construction	4995	5375	6346	7067	7859	8412	8868	9077	9235	9940
Agriculture	1040	959	1155	1412	1638	1703	1576	1504	1551	1563
Health and welfare	1942	2854	4586	6095	6028	5823	5571	5691	6265	6458
Service	1245	1952	2796	3898	5080	5800	5363	5343	5515	5504
Total	**28234**	**34542**	**49574**	**60409**	**65659**	**68287**	**68168**	**68399**	**68985**	**69113**

From the table we can see that the number of students in the science and technology field has grown overall. The longer standard period of study and the fact that the studies become protracted due to hiring of students and the general popularity of higher education account for the growth. If we look at the share of technology, manufacturing and construction fields in the total number of students, we see that it had fallen from 18 percent to 14 percent by 2010/11. The number of students in social sciences, law and commerce has seen solid growth. In the opinion of the entrepreneurs, such an educational structure is not sustainable, as in some fields, there is an oversupply of workforce, while in technical areas unemployment will persist.

Construction specialists come from the architecture and construction area, which in turn is divided into two study curriculum groups: architecture and urban planning and construction and civil engineering works.

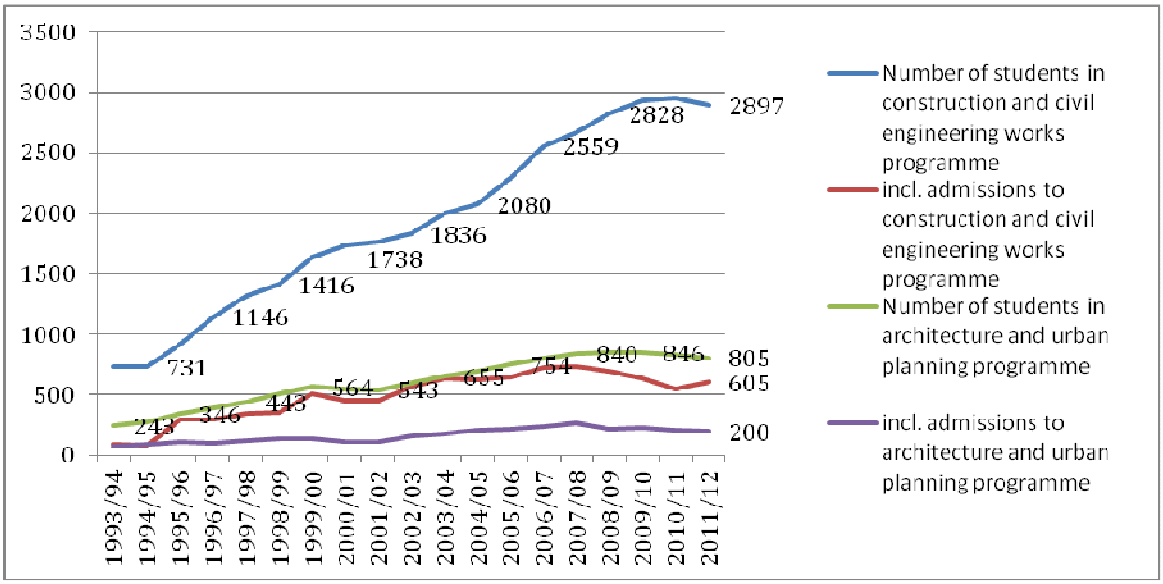


Figure 6.12. Admissions to the architecture and construction area of study and number of students[57]

[56] Statistics Estonia, general educational statistics, higher education. http://pub.stat.ee/px-web.2001/Dialog/varval.asp?ma=HT295&ti=K%D5RGHARIDUSE+OMANDAMINE+HARIDUSASTME+JA+KOOLITUSALA+J%C4RGI&path=../Database/Sotsiaalelu/05Haridus/10Kergharidus/&lang=2

[57] EEIS, extract from the register of curricula as of 11 April 2012. http://www.hm.ee/ehis/statistika.html

One institution of professional higher education and three universities offer higher education in the field of construction. Study opportunities have been divided between Tallinn and Tartu, and to a limited extent Tallinn University of Technology's Virumaa College in Jõhvi makes construction related studies possible. At the same time, Estonia is a sufficiently small country for education to be available to all. The titles of curricula and specialization options are relatively multifaceted.

Table 6.17. Curricula in the construction specialities and specialization options

Educational level, educational institution	Curriculum group	Curricula
ARCHITECTURE AND CONSTRUCTION		
Professional higher education		
Tallinn University of Applied Science	Architecture and urban planning Construction and civil engineering works	Applied architecture Construction of buildings Applied geodesics Road construction
Bachelor's study		
Estonian Academy of Arts	Architecture and urban planning	
Estonian University of Life Sciences	Architecture and urban planning Construction and civil engineering works	Landscape architecture Geomatics. Geomatics and land readjustment for specialization
Integrated bachelor's and master's study		
Estonian Academy of Arts	Architecture and urban planning	Architecture and urban planning
Estonian University of Life Sciences	Construction and civil engineering works	Rural construction
Tallinn University of Technology	Construction and civil engineering works	Environmental technology. Water technology, heating and ventilation, environmental management for specialization Transport construction. Road construction, bridge construction and geodesics for specialization Industrial and civilian construction technology, construction economics and management, port construction and coastal technology
Master's study		
Estonian Academy of Arts	Architecture and urban planning	Landscape architecture
Estonian University of Life Sciences	Architecture and urban planning Construction and civil engineering works	Landscape architecture Rural construction Land readjustment Geodesics Building energy efficiency
Tallinn University of Technology	Construction and civil engineering works	Environmental technology. Water technology, heating and ventilation, environmental management for specialization Transport construction. Road construction, bridge construction and geodesics for specialization Industrial and civilian construction technology, construction economics and management, port construction and coastal technology
Doctoral study		
Estonian Academy of Arts	Architecture and urban planning	Heritage conservation and restoration
Tallinn University of Technology	Construction and civil engineering works	Construction and environmental technology
TECHNICAL FIELDS		
Doctoral study		
Estonian University of Life Sciences	Technical areas	Rural construction. Rural construction, real estate management for specialization

Higher education is taught in four academic levels in the construction field: at the professional higher education, integrated bachelor's and master's study, master's and doctoral level. There are no curricula related to building construction in bachelor's study. The greatest number of students is in integrated bachelor's and master's study where the amount of study is 300 credit points and the duration is usually five years. After higher education reform, this level of study replaced diploma study in engineering. Unlike the bachelor's and master's study (3+2 years) system in other fields, in integrated study it is not possible to complete the speciality studies in the interim. The number of students in the construction field has grown overall but it is still less than the total number of university students.

Table 6.18. Data on students, graduates and dropouts, 2007–2012[58].

Field of study: technology, manufacturing and construction. Field of study: architecture and construction. Curriculum groups: architecture and urban planning, construction and civil engineering works.

Professional higher education		**2007/08**	**2008/09**	**2009/10**	**2010/11**	**2011/12**
Architecture and urban planning	Students	249	262	287	288	281
University of Applied Sciences	Graduates	32	35	45	35	
	Dropped out	30	11	16	43	
Construction and civil engineering works	Students	879	927	997	1056	1049
University of Applied Sciences	Graduates	70	81	115	107	
	Dropped out	140	88	102	188	
Bachelor's study		**2007/08**	**2008/09**	**2009/10**	**2010/11**	**2011/12**
Architecture and urban planning	Students	330	312	271	234	199
Academy of Arts	Graduates	46	70	56	60	
	Dropped out	50	51	37	43	
Construction and civil engineering works	Students	7	2	2	–	
University of Life Sciences	Graduates	5	1	2	–	
	Dropped out	1	–	–	–	
Integrated bachelor's and master's study		**2007/08**	**2008/09**	**2009/10**	**2010/11**	**2011/12**
Architecture and urban planning	Students	102	105	102	104	107
Academy of Arts, TUT	Graduates	16	9	13	8	
	Dropped out	8	12	11	16	
Construction and civil engineering works	Students	1602	1765	1804	1759	1702
TUT, University of Life Sciences	Graduates	97	112	159	171	
	Dropped out	260	232	231	233	
Master's study		**2007/08**	**2008/09**	**2009/10**	**2010/11**	**2011/12**
Architecture and urban planning	Students	154	165	184	201	217
Academy of Arts	Graduates	27	39	39	51	
	Dropped out	31	20	27	12	
Construction and civil engineering works	Students	121	68	57	51	59
University of Life Sciences, TUT	Graduates	42	21	8	14	
	Dropped out	44	25	18	13	
Doctoral study		**2007/08**	**2008/09**	**2009/10**	**2010/11**	**2011/12**
Architecture and urban planning	Students	5	3	2	3	1
Academy of Arts	Graduates	–	–	–	–	
Construction and civil engineering works	Students	63	66	73	84	87
University of Life Sciences, TUT	Graduates	7	5	7	3	

[58] EEIS, extract as of January 2012.

The number of graduates in the construction speciality has grown over the years: there were 182 in 1994, and 449 in 2011. Yet it is important to look at how many of those who enter the speciality end up graduating and being awarded engineer qualifications.

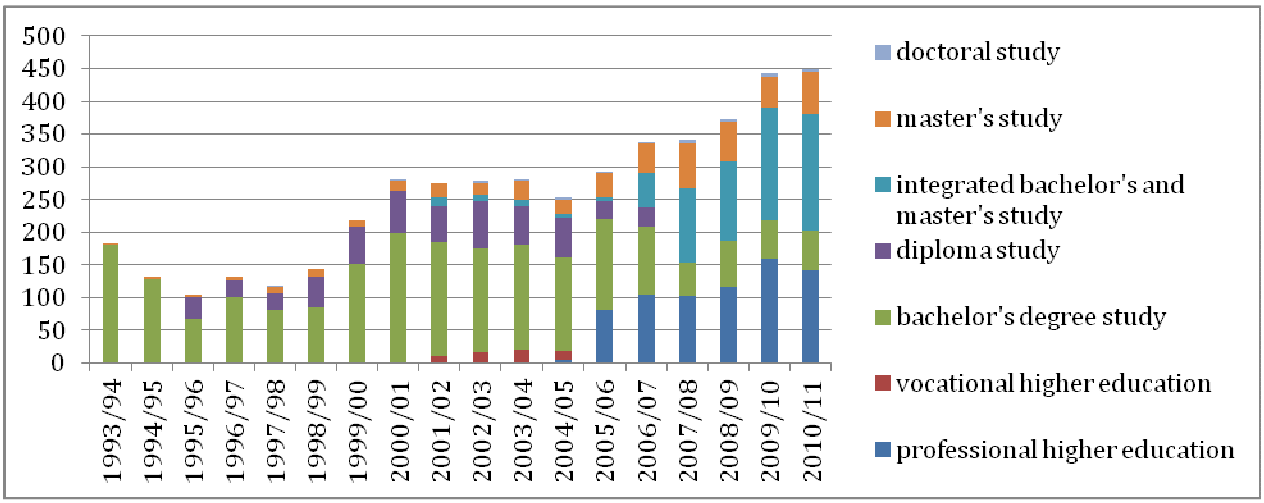


Figure 6.13. Graduates of the architecture and construction area of study by level of study

A problem in the architecture and construction area of study is the high number of dropouts. In 2010/2011, 449 graduated but 559 dropped out. The total number of dropouts has constantly exceeded the number of graduates. It is slightly better in architecture and urban planning curricula. The dropouts occur primarily in the first two years of study. The fact that the students have a relatively weak grounding in science subjects certainly has a role to play: students are not capable of mastering basic maths and physics subjects that are critical in construction specialities.

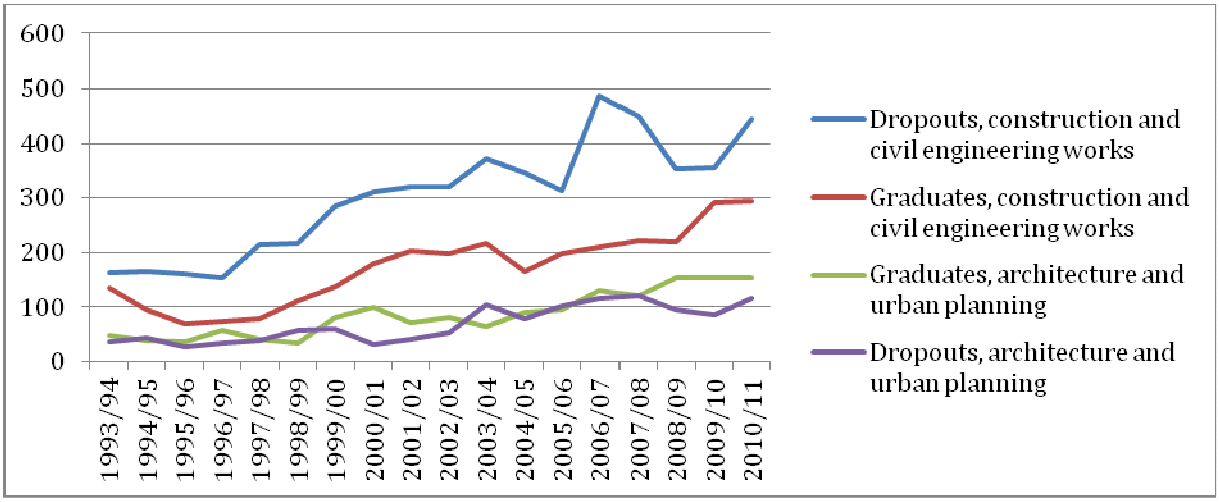


Figure 6.14. Graduates of and dropouts from the architecture and construction areas of study

Most of those who dropped out from the construction and civil engineering works curriculum group were students in integrated bachelor's and master's study, but there were also many dropouts who were seeking professional higher education. Compared to other areas of study, there were significantly more dropouts in construction. While in other fields, it was conceivable for people who had partially completed the study to

be employed in the speciality, this is generally not possible in fields that require engineering certification and the dropouts head to work elsewhere or gain employment in work that requires a much lower qualification.

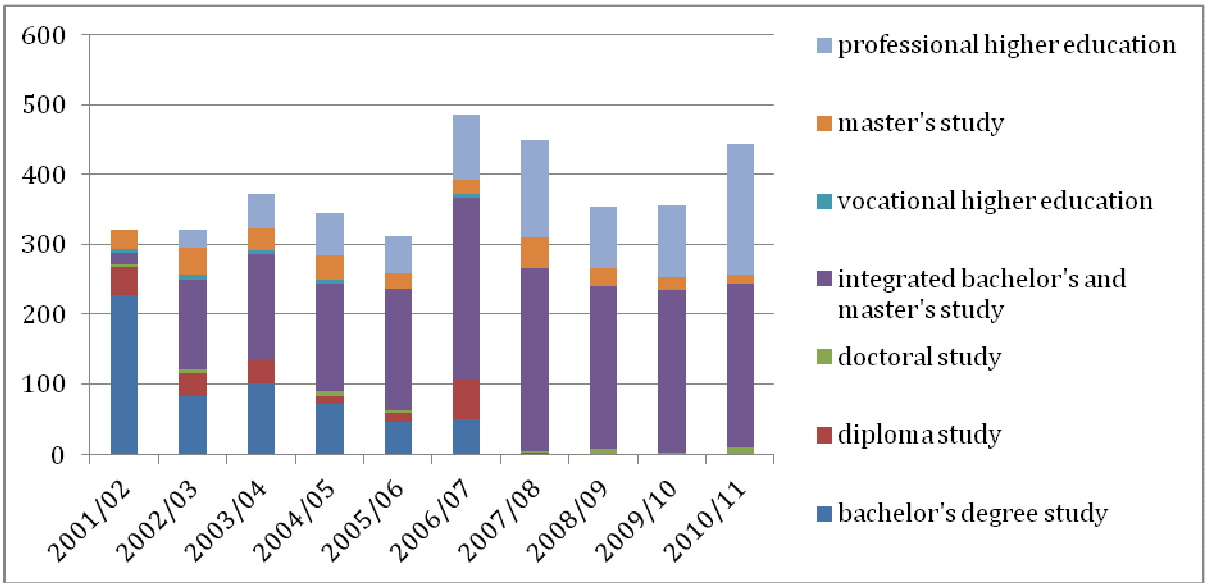


Figure 6.15. Dropouts from the construction and civil engineering works curriculum group, by level of study

These figures do not nevertheless reflect only those who drop out and never resume study. Namely, those who switch to different specialities or go to another area of study or transfer to a different institution of higher education are also counted as dropouts. For instance it is common for students in Tallinn University of Technology curricula to transfer to Tallinn University of Applied Sciences curricula. There is also hope that students who are forced to drop out due to exceeding the permitted period of study will make up the lacking tests and exams through open study and end up graduating eventually.

Bringing back dropouts and guiding them to a successful graduation is one of the most promising routes to adding higher-educated workforce in the field of construction. The Ministry of Education and Research has set this a priority through the programme TULE (Acronym explained in English: Come back and graduate successfully!) through which those who dropped out in the period from 1 September 2003 to 22 September 2009 can continue in a free student place. Hopefully the positive impact of this measure on the number of graduates will be felt already in the near future, as many of those who resume study have only the final phase of study to complete.

6.2.5. Treatment of building energy efficiency in the curricula of the construction field

To a limited extent there are subjects aimed directly at energy efficiency in all of the curricula of the construction field and at all levels of study. There are the most of them in the Tallinn University of Technology Building energy efficiency master's curriculum. At the integrated bachelor's and master's degree level, the Tallinn University of Technology engineering curricula contain the following subjects: energy efficiency and its economic evaluation, building planning and façade shaping, modelling and analysis of thermal behaviour of buildings, sustainable use of electrical energy in buildings, smart buildings, internal

climate of buildings.[59] The Estonian University of Life Sciences curricula include sustainable and environmentally friendly construction and energy as well as building energy supply and energy audits.[60] The Estonian Academy of Arts architecture and urban planning curriculum includes building energy efficiency and energy efficiency and modelling software subjects.[61] The Tallinn University of Applied Sciences deals with energy efficiency at the professional higher education level in the building technical utility system and energy efficiency subject.[62]

Higher education curricula are mainly expansive, with little room for adding new subjects. It is thus important to share with students the knowledge in the area of energy efficiency as themes taught throughout in basic general and core subjects. To a great extent, the topics are already dealt with in the following subjects: construction physics, materials technology, ventilation and ventilation design, heating systems, heat economics etc. The development of the content of the subject is the task of the institute/chair responsible for the field and of the subject teacher, thus a similarly titled subject may be treated differently at different institutions of higher education. The preparation of the content and materials of study for several subjects is a very labour intensive work, and adding energy efficiency topics requires the existence of training materials and sample tasks. To increase the quality of academic work in this area, it will be necessary to develop a single set of standards as to how themes will be treated, sample materials, and functions for use for all teachers related to the topics.

The construction sector hires specialists from curricula such as energy, heat technology, automation, energy technology, environmental technology or native construction. In most of these curricula the topics of energy efficiency are taught as specific subjects and thus related specialities must be considered when developing the work and they must be involved in the development process.

Topics related to energy efficiency are represented also in research conducted at Estonia Estonian universities. For example, over 10% of the doctoral dissertations at the TTÜ in the field of construction and environmental technology are related to research into building energy efficiency. For instance, the following areas of research: buildings and the energy efficiency of their technical utility systems, heat recovery ventilation in ensuring air exchange and interior climate in apartment buildings, low-energy-use building energy efficiency and interior climate, possibilities of using renewable energy sources in low energy use buildings. The academic work carried out by doctoral students brings the topic of energy efficiency to the bachelor's and master's study level as well.

In the framework of the project BuildEst, all teachers in the building construction speciality and teachers who teach basic subjects in the construction speciality in different institutions of higher education are considered a target group:

- At the level of professional higher education, in the faculty of architecture and environment technology and the construction science faculty at the Tallinn University of Applied Sciences, close to 20 teachers, and a total of eight teachers at the TTÜ Tartu and Virumaa Colleges.

[59] Curricula entitled "Energy efficiency of buildings", "Construction and environment technology", "Environmental technology", "Industrial and civilian construction". http://ois.ttu.ee/pls/portal/ois2.ois_public.main

[60] "Rural construction" curriculum. http://www.emu.ee/userfiles/Sisseastujale/erialad/2012/EH-int-2012.pdf

[61] "Architecture and urban planning" curriculum. http://www.artun.ee/index.php?lang=est&main_id=1234

[62] "Building construction" curriculum. https://tktk.ois.ee/curriculum-subject?curriculum_id=14&year=2011

- At the level of bachelor's, master's and integrated bachelor's and master's study as well as doctoral study, close to 60 teachers are to some extent related to the topics at the Tallinn University of Technology's construction faculty, close to 30 teachers at the Estonian University of Life Sciences rural construction department and technical institute and five teachers at the Estonian Academy of Arts architecture faculty.
- In addition, individual teachers from related fields (such as heat technology, energy, automation and real estate management).

In the case of technology, manufacturing and construction teachers, the concern is their advanced average age and low replacement rate, which jeopardizes longer-term continuity. Underutilization of teacher's work has not promoted competition with the private sector to attract talented graduates of master's and doctoral study. Positive aspects include the active participation of teachers in the operation and management of professional associations, which allows close interaction with private sector specialists in the construction field.

The form for involving teachers in development work and sharing knowledge needs to be comprehensively thought through. The research areas and needs for information are so different that it is likely that teachers' networking and exchanges of experience will generate more benefits than traditional education activity. Certainly knowledge about building energy efficiency will be broadened by learning more about the experiences of foreign experts.

6.3. Adult education in the construction field

6.3.1. Legislative regulation of adult education

Professional in-service training is governed by the Adult Education Act[63], which sets forth the fundamentals of adult training and legal guarantees for desired study throughout one's lifetime. In accordance training falls into the following categories based on purpose: formal training, professional training and informal training. Pursuant to legislation, professional and informal training can be organized by adult training institutions: state and municipal institutions, private schools with a training permit, private and public legal persons and sole proprietors. A precondition is the fact that adult training is an activity stemming from legislation or articles of association. As adult professional training is a very broad field, it is regulated by a number of legal acts besides the Adult Education Act (see Annex 4).

Based on the purpose of study, professional training take place as follows:

- **as primary** study to allow persons not certified in a speciality or profession to acquire elementary professional and specialized knowledge skills and experience;
- **as retraining** to allow them to acquire new professional and specialized knowledge skills and experience;
- **as in-service training** to supplement existing professional and specialized knowledge skills and experience.

Professional training allows one to acquire and supplement professional and specialized knowledge, skills and experience as well as retraining on the job or at a training establishment. Professional training is offered at courses of different lengths, which, if completed, does not automatically lead to the next, higher

[63] Adult Education Act, adopted 10 November 1993, RT I 1993; 74; 1054. https://www.riigiteataja.ee/akt/13336805&leiaKehtiv

educational level. Successful completion of professional training is certified by a document issued by the institution that organizes the training.

Regardless of the form of ownership, adult education institutions shall act independently in the organisation of study, in the selection of forms of study, curricula and teaching methods and in the use of funds within the limits established by legislation (Section 11 of the Adult Education Act). Pursuant to the "Adult education development plan for 2009–2013"[64] the Ministry of Education and Research prepares amendments to the Adult education Act to refine definitions, supplement the concept of non-formal education, introduce the requirement so output-based curricula and single requirements for graduation documents as well as to set forth in legislation the creation of an adult education subregister in the Estonian Education Information System (EEIS). As a result of the amendments, groundwork is laid for carrying out state supervision and submitting SCE for in-service training institutions.

Construction related in-service training is offered at all vocational educational institution, institutions of professional higher education and public universities that offer formal education in the field. In general, the selection of training topics proceeds from fields of formal education. Special programmes are prepared for trainings ordered by companies and professional associations. **Other providers of training on the market are professional associations and private training companies.**

6.3.2. Professional in-service training at vocational educational institutions

Vocational educational institutions enter the in-service trainings they offer into the EEIS, as a results of which they are precisely documented and can be analyzed. On the basis of the EEIS data, we can argue that all of the vocational educational institutions that offer formal study have also organized, in the past four years, professional in-service training. Figure 6.16 offers an overview of the number of participants in construction field trainings in the last few years.

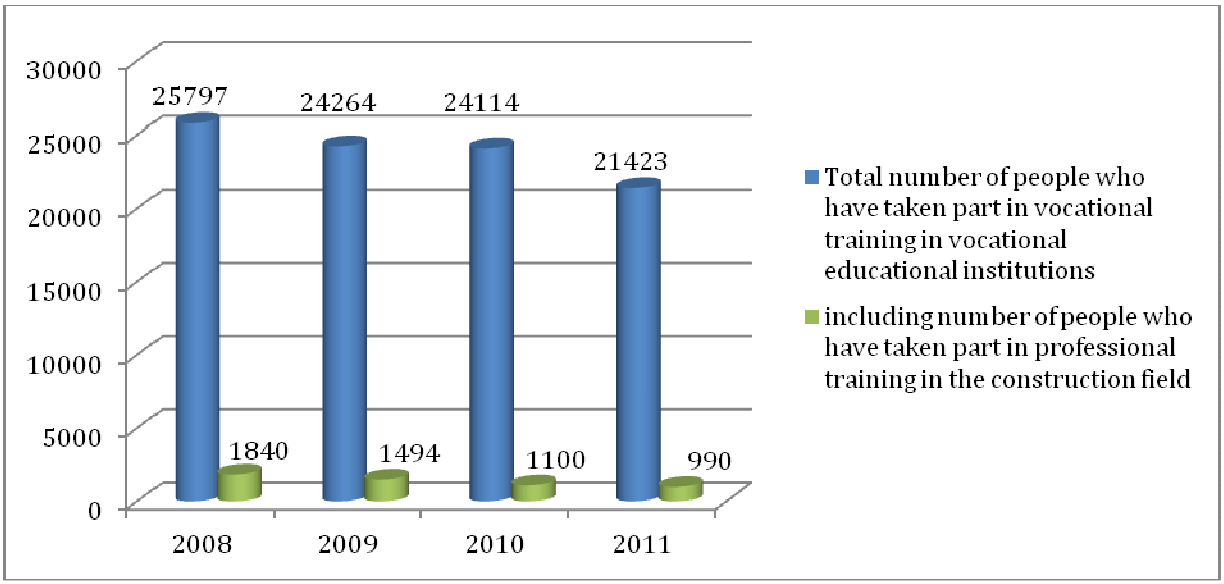


Figure 6.16. Participants in professional in-service training at vocational educational institutions from 2008-2011[65]

[64] Adult educational system development plan, 2009-2013. www.hm.ee/index.php?popup=download&id=9426

[65] EEIS, extract from the register of training activities of vocational educational institutions.

On the basis of the data entered by vocational educational institutions into EEIS (table 6.19) the greatest number of in-service trainings have been held for construction finishing specialists, carpenters and masons. **The in-service training programmes offered by vocational educational institutions are thorough (80-400 contact hours), and the average length of the trainings has grown significantly in the recent years.**

Table 6.19. Professional in-service training for target groups in the construction field[3.]

Training target group	2008		2009		2010		2011	
	Trainings	Average number of hours	Trainings	Average number of hours	Trainings	Average number of hours	Trainings	Average number of hours
Construction finisher (incl. plasterer, tile installer, painter, flooring installer)	47	90	39	116	23	79	36	70
Carpenter	10	60	6	70	13	125	11	164
Bricklayer[66]	30	109	47	98	32	87	25	94
Plumber	6	74	12	119	7	110	11	105
Ventilation technician	2	40	1	40	–	–	–	–
Concrete worker	2	320	–	–	5	51	3	86
Sheet metal worker	–	–	5	56	3	58	4	100
Machinery operator	2	32	1	28	1	43	–	–
Welder	–	–	–	–	–	–	–	–
Electrician	–	–	1	40	–	–	–	–
Other construction worker	42	27	17	25	17	43	11	44
Employee at engineer level	1	12	–	–	1	24	1	8

As a supplement to the data for 2008–2011 we can note the SCE for adult vocational training submitted to the vocational educational institution by the Ministry of Education and Research for the spring semester of the 2012 academic year.[67] A total of 175 courses were ordered from 32 vocational educational institutions, including, in the construction and civil engineering works curriculum group, 24 courses from 15 vocational educational institutions.

Table 6.20. SCE for professional in-service training in the construction and civil engineering works curriculum group[68] in the first half-year of 2012

Free of charge courses at vocational schools and institutions of professional higher education	**Volume, hours**	**incl. lecture hall work**	**incl. practicum work**	**Students**	**Total cost €**
Total SCE at the vocational education level	6730	3000	5729	2281	481 775
SCE in the construction and civil engineering works curriculum group	1418	362	1056	336	100 849
Share of the construction field (%)	21	12	18	15	21
Topics related to building energy efficiency	344	120	224	73	29 552
Share of building energy efficiency topics in SCE in the construction field, %	24	33	21	22	29

[66] Including training for potters.

[67] Courses included in the order for the first half of 2012. http://www.hm.ee/index.php?popup=download&id=11765

[68] Ministry of Education and Research. http://www.hm.ee/index.php?048404

Amount of SCE in the construction and civil engineering works curriculum group has remained at the level of years past. Analyzing the total amount of SCE, we see an opportunity to increase the share of technology, manufacturing and construction as a high-priority field. The training topics offered also need to be better integrated with the need of companies for workforce. The share of building energy efficiency topics can be increased already through the SCE for the second half of 2012. In 2013 and 2014 already up to 80% of the SCE at vocational education institutions should be linked with building energy efficiency. This is the most important measure for increasing the amount of training activity at the worker level.

6.3.3. Professional in-service training at the level of professional higher education and higher education

In the field of construction, in-service training has been offered by one institution of professional higher education – the Tallinn University of Applied Sciences – and three public universities – the Estonian Academy of Arts, Estonian University of Life Sciences and the Tallinn University of Technology. As in vocational educational institutions, the selection of training topics also proceeds primarily from the formal educational curricula. Special programmes are prepared for trainings ordered by companies and professional associations.

Unlike vocational educational institutions, not all in-service trainings organized by institutions of professional higher education and institutions of higher education are reflected in the EEIS. At the same time, we can assert on the basis of the information on the websites of the institutions of higher education and a telephone survey that in the last four years all institutions of higher education have offered adult professional in-service training in addition to formal education.

The four universities mentioned have in the period 2008–2011 organized an average of 22 different construction-related in-service training courses a year with an average volume of 42 hours, including participants' independent study.

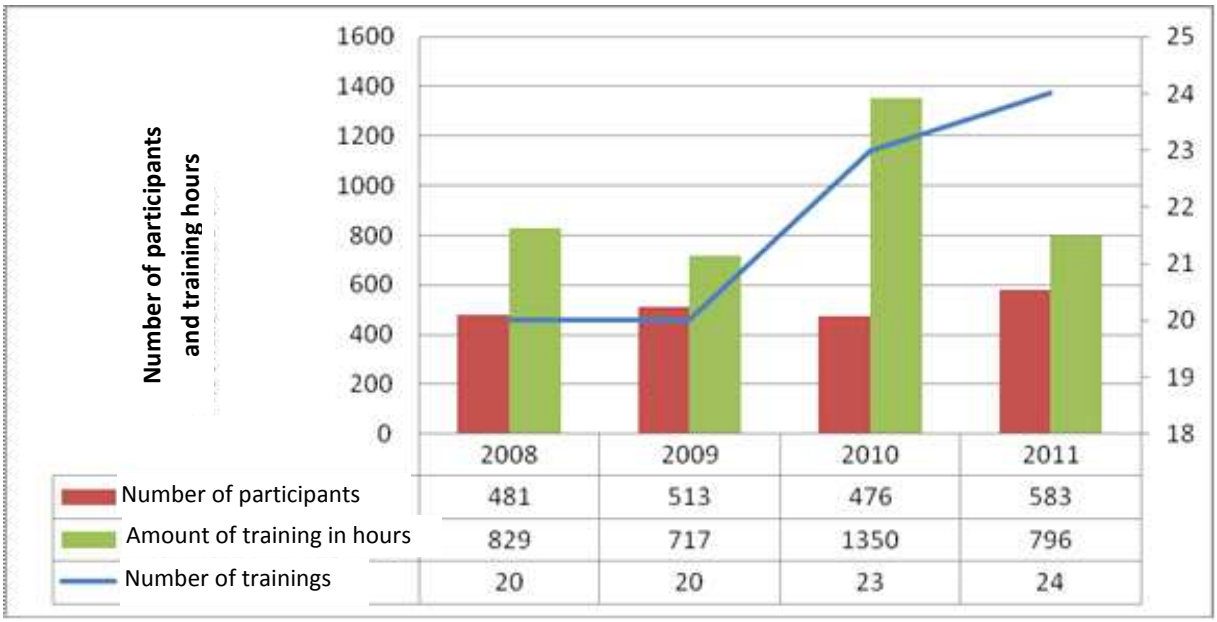


Figure 6.17. Total volume of in-service training in the construction field at the higher educational level[69]

[69] Data are consolidated on the basis of summaries of training activity sent in by the Tallinn University of Technology, Tallinn University of Applied Sciences, Estonian Academy of Arts and the Estonian University of Life Sciences.

In addition to conventional training courses, working adults have the possibility of studying individual formal education subjects at universities through informal education. This is one of the easiest and affordable (for both companies and individuals) ways to take extensive study or conduct retraining within a given field. **E.g. in 2011, in-service training participants completed over 2000 credit points of subjects through informal education in the construction field at Tallinn University of Technology.** The goal of a large part of the students was to complete formal education studies, but it can be presumed that 20% of the declared credit points – 10,000 hours of training – were completed for the purpose of professional in-service training by students who already have engineering education.

According to data from the said institutions of higher education, it is above all engineering and technical personnel who take part in the trainings. In-service training has been held for construction managers (University of Applied Sciences), architects (Academy of Arts), geodetic experts and wood-building construction specialists (University of Life Sciences). The selection of target groups has been broadest at Tallinn University of Technology:

- heating and ventilation system engineers and technicians;
- water supply and sewerage engineers and technicians;
- road construction engineers;
- construction managers;
- facility service persons.

With regard to institutions of higher education, the Tallinn University of Technology has dealt with building energy efficiency as a separate training field. **In-service training has been offered to heat and ventilation engineers, facility service persons, architects, designers and local government leaders**.

In 2008, Tallinn University of Technology experts took part in developing guideline materials for energy use audits in buildings and a description of the organizational process, and requirements for the occupational standard for energy auditor[70], the building energy label form and procedure for issuing it, and the occupational standard for issuer of building energy label[71]. Study materials for training the auditors and building energy label issuers were prepared. TTÜ has, on the basis of the developed study materials, organized 12 in-service trainings for 156 auditors and for 202 building energy label issuers. Pursuant to the "Procedure for granting occupational qualifications in the field of building energy efficiency"[72] the Association of Heating and Ventilation Engineers (EKVÜ) had issued, as of 30 April 2012, 80 occupational qualifications certificates for energy auditors and 111 occupational qualifications certificates for building energy label issuers. It will be very important to keep the active experts abreast of developments in the field.

6.3.4. Training offered by the private sector

To map out the construction-related in-service training offered by the private sector, a questionnaire was sent to 20 training providers who had recently forwarded information on training of workers in the construction field either to the Ministry of Education and Research or via public information channels. In addition, three construction professional associations received the questionnaire. Responses came in from

[70] Occupational standard for energy auditors. www.ekvy.ee/attachments/article/13/Energiaaudiitori%20kutsestandard.pdf

[71] Occupational standard for issuers of energy labels for buildings. www.ekvy.ee/attachments/article/13/Energiamärgise%20väljastaja%20kutsestandard.pdf

[72] Procedure for awarding occupational qualifications in the energy efficiency field. www.ekvy.ee/attachments/article/13/EKVÜ%20KUTSE%20ANDMISE%20KORD_2%2006%202010.pdf http://www.kutsekoda.ee/et/kutseregister/kutsetunnistused

14 training companies and professional associations. Of the respondents, six offered training only at the construction worker level, 4 for only engineering and technical personnel and 4 companies or associations offered training to both target groups. It is unfortunately not possible to assess the total amount offered by private training providers as these data are not collected as part of official statistics and the companies are not prepared to submit data to the survey takers by target groups and by number of training hours as it is too labour intensive to prepare a separate summary for the survey.

Table 6.21. Target groups for the private sector's 14 training institutions

Target group	Trainers
Construction finisher (incl. plasterer, tile installer, painter, flooring installer)	3
Carpenter	5
Bricklayer	3
Plumber	2
Ventilation technician	2
Concrete worker	2
Sheet metal worker	2
Machinery operator	2
Welder	3
Electrician	3
Other construction worker*	5

*Primarily installers of windows and doors, demolition workers, crane operators and slingers.

Of the 14 training institutions that responded, six offered study for one or more target groups among the construction workers. More attention is paid to training construction finishers, carpenters, bricklayers, welders and electricians. This division is understandable as they are the largest of the target groups in the construction field. Of the training topics, large-scale courses were cited: 90–300 hours for log house builders, 160–360 hours for potters, 56 hours of painters, 60 hours for installers of windows and doors.

Data on training of engineering-technical employees are presented in more detail. Of the data for respondents, it is possible to state the number of trainings and the number of participants. Predominantly these are trainings of up to 8 hours that are much shorter than the average length at the worker level. Table 6.22 gives a sense of what the training volume is in engineer training, yet it must be said that the actual training volume may be much greater. Nor are the data from the technical utility system and road construction field comprehensive as the main trainers in these fields have not specified the themes and volumes precisely.

Table 6.22. Private sector trainings for engineering and technical workers in 2010–2011

Field	Trainings	Participants
General construction	35	1336
Technical utility systems	1	110
Road construction	8	192
Other related fields (such as occupational safety, real estate, plans, automation, management of electrical work)	90	1519

Of the more detailed training themes, 10-15% deal with building energy efficiency. For instance: building internal climate and energy efficiency, energy efficient wood buildings and wood as an environmentally beneficial construction material, energy management, what it is, energy-efficient buildings, construction structures and energy-efficient buildings design and construction of energy –efficient homes. To this point, the trainings have been largely short, presented as an overview information day, but recently there have been longer and more comprehensive training programmes, thus the potential for dealing with the field has increased.

The survey of training enterprises and professional associations gives an overview of which fields companies see as having development potential and what in particular they plan to develop. For the most part, they prefer maintaining (23%) or increasing (38%) training volumes on the worker level, while 38% of respondents planned to reduce or even end training for construction workers. Companies mention their desire to specialize more than in the past on training activity at the engineer level. With regard to target groups, a growth in the number of training aimed at plumbers, ventilation technicians and electricians is envisioned. We can presume that they are responding to improved market demand in these fields. Large target groups – construction finishers, carpenters, masons – will have their training volume kept at the same level or reduced.

In the near future, training firms and professional association envision expansion of educational activity aimed at engineering-technical personnel (five of eight companies) for instance with regard to technical utility system employees and other target groups (architects, designers, electrical engineers). One training company envisioned reduction in training for engineering and technical employees.

We also asked for a response to the question of what is hindering the supply of in-service training in the field of construction. The main reason cited was the low amount of training orders, as well as low interest from employees in the field, which point to the cautiousness and austerity characteristic of an unstable economic environment. The respondents have explained that companies have, in general, planned too few resources, while trainings are a part of development activity; thus the recession-era thriftiness is continuing. In micro enterprises a problem has been that trained employees become lost to the company. A lack of qualified trainers is also a keenly felt problem. This is a field in which the BuildEst network could address as part of continuing activities, creating contacts for bringing international trainers to Estonia and opportunity to develop local training capacity and developing lecturer skills of practicing experts.

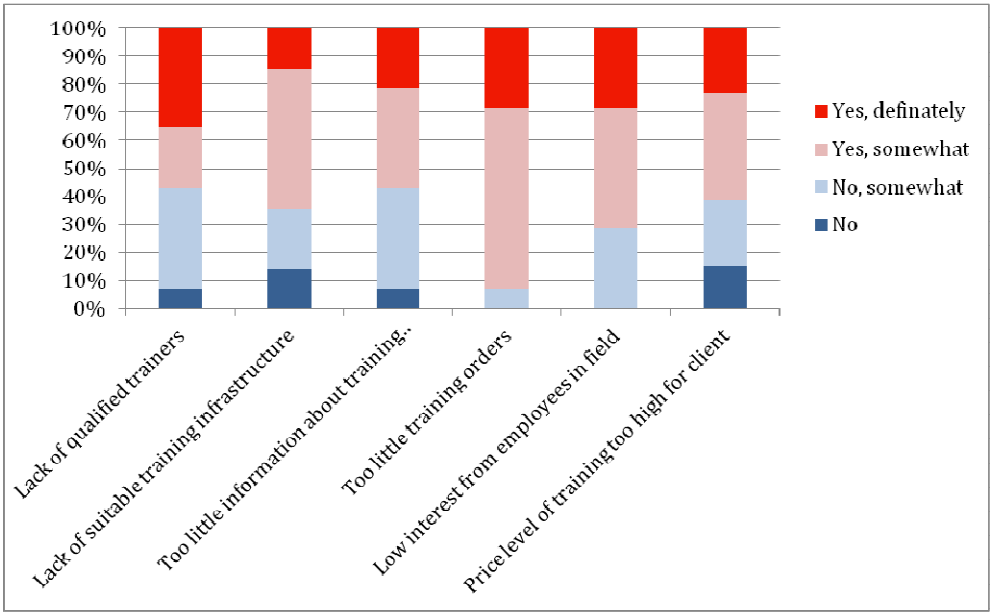


Figure 6.18. Reasons that training companies believe hinder supply of in-service training in the field of construction

Sixty percent of training enterprises have provided instruction pertaining to energy conservation or energy savings, yet it is surprising that 40% of them have not dealt with energy efficiency. The general themes deal more with innovative energy-efficient materials and topics and technological solutions in the construction process that are aimed at energy-efficiency. The refined range of topics sets out the energy-efficiency strategy, design concepts, legislation, energy-efficiency lighting technology, heat pump solutions, design and construction of energy-efficient private homes, design of energy-efficient buildings, interior climate of rural homes, construction physics and energy conservation.

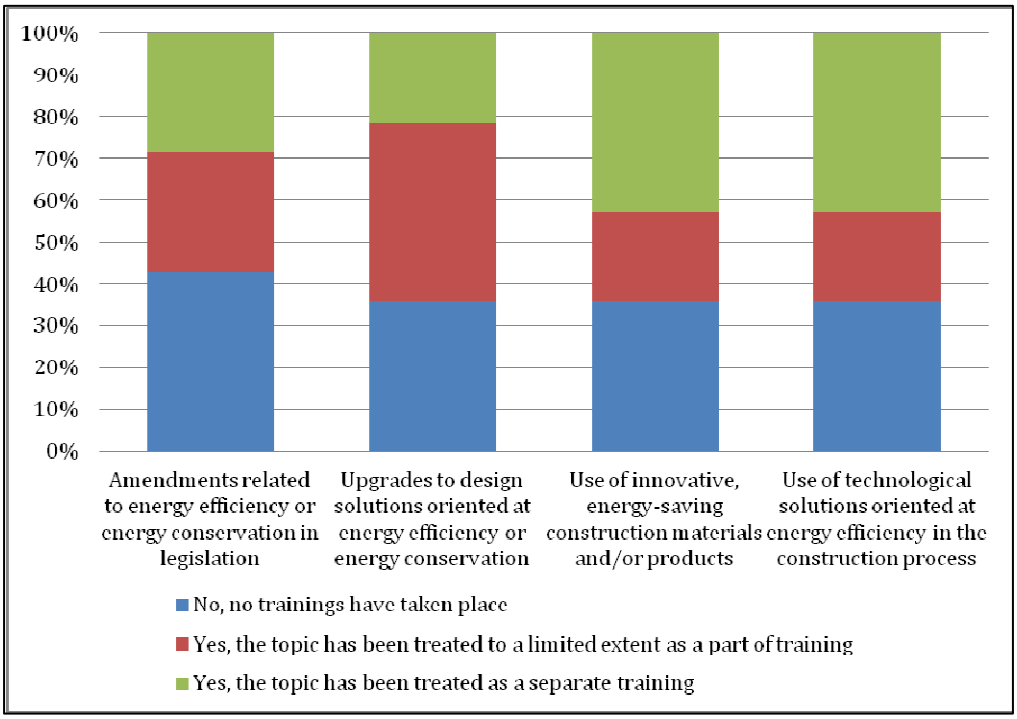


Figure 6.19. Share of training firms that dealt with energy-efficiency or energy conservation topics in 2010–2011

Most of the training enterprises that responded to the survey are prepared to offer instruction in the field of energy-efficiency, with only one company not wishing to deal with these topics. For the BuildEst project network, this is certainly positive, there are enough potential cooperation partners. Readiness to train specialists at the engineering level was much larger than in regard to construction workers. Presumably training firms proceed from the experience that companies are much more likely to finance training at the engineer level. At the same time, trainers stress in their responses that their business model is built on flexibility. On the basis of companies' wishes, new training programmes are developed or existing ones are adapted and suitable lecturers are found. This points to the possibility that if the topics of energy-efficiency are prioritized for companies through national legal acts or the occupational qualifications system, training enterprises would be prepared to offer it pursuant to orders as well.

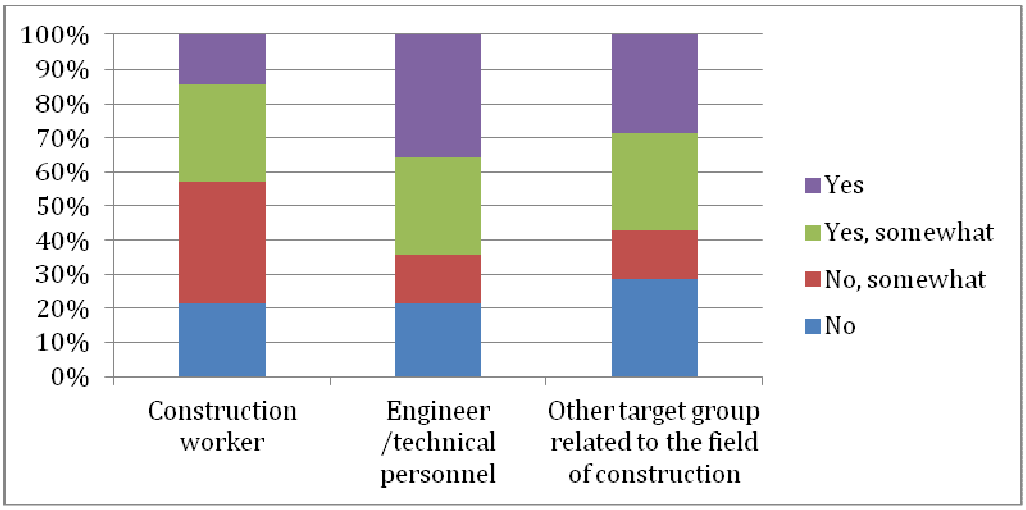


Figure 6.20. Target groups to which training companies are prepared to offer energy-efficiency training

6.3.5. Financing of professional in-service training

- **Financing of professional in-service training taking place in vocational educational institutions**

As the entity funding professional in-service training taking place at vocational educational institution, EU structural funds have an important role through various measures. EEIS statistics distinguish as financing sources state commissioned education (SCE), project grants (ESF), Unemployment Insurance Fund financing and contributions from participant and companies. The first three measures are either fully or partially EU structural fund financing.

SCE for vocational schools is financed in 2007-2007 by the ESF and the Ministry of Education and Research from the ESF programme "Adult Vocational Training and Development Activities". The state commissioned courses – free for participants – are prepared by semester in June and December of each year.[73] In the years 2008–2011, vocational educational institutions sought additional support for organizing courses from the ESF structural fund implement body Innove via the ESF operational programme for the development of human resources "Increasing supply of qualified workforce" and the measure "Development of learner-

[73] http://www.hm.ee/index.php?048404

centred and progressive vocational education and supplementation of the opportunities for lifelong learning".

The Unemployment Insurance Fund finances study opportunities through procurement competitions announced for a specific target group and topics or on the basis of a training programme for the unemployed "Training Card". Under the training programme, clients are compensated up to 2,500 euros in training costs. The Unemployment Insurance Fund's training procurements and the training programme are co-financed from the ESF from the framework programme "Increasing supply of qualified workforce 2007–2013".[74]

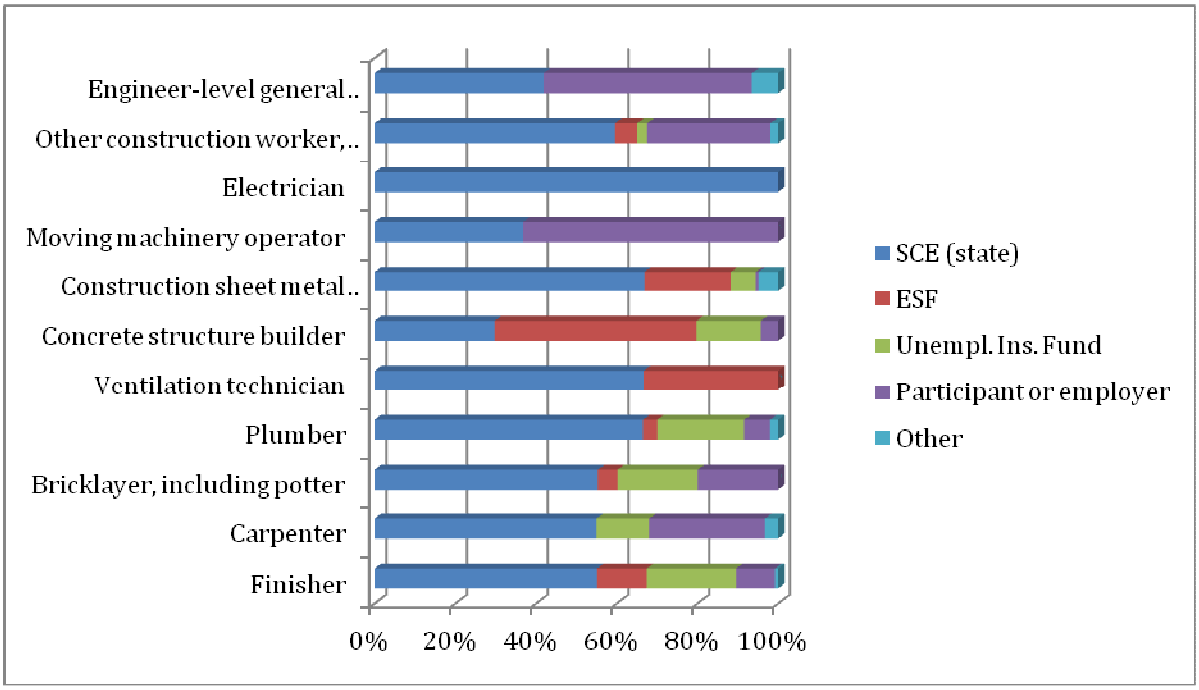


Figure 6.21. Financing of professional in-service training with regard to occupational qualifications in the field of construction

- **Financing of training at the level of higher education**

The Universities Act allows a small part of the financing for SCE of formal education (10% in technology, manufacturing and construction) to be used for offering in-service training. The basis for the calculation are the training hours completed, which are converted into credit points according to a rate of 26 academic hours being equal to 1 ECP. The permitted rate of expenditure for in-service training is around 20 euros per ECP. The biggest problem is that the rate of expenditure covers just 10% of the costs of in-service training. Thus it is not possible to offer participants noteworthy discount through SCE.

There is no similar national in-service training SCE system yet that would cover all costs of training at the higher educational level. The Adult education development plan 2009–2013 prepared by the Ministry of Education sets the goal of developing principles for financing vocational training offered at institutions of higher education through SCE and to determine priority target groups.[75] Hopefully these principles will make it possible to offer training on the basis of SCE to a wider number of interested parties.

[74] http:/www.tootukassa.ee/index.php?id=13015

[75] "Adult education development plan 2009–2013" and its implementing plan. http://www.hm.ee/index.php?03236

There are no uniform data regarding financing of in-service training at the higher educational level. On the basis of the primary training provider in the construction sector, Tallinn University of Technology, participation in training is financed by the students themselves and their employers and to a lesser extent, the ESF's financing measures, Archimedes foundation, Innove foundation grants and through competitions or Unemployment Insurance Fund orders. The total volume of in-service training on the basis of higher education in terms of monetary value in 2011 was 1,787.4 million euros, of which the volume of construction training activities was an estimated 23,000 euros. In summary, it can be said that this volume is very low and points to economic difficulties at construction companies as a result of which it is difficult to launch training programmes and the activity rate was low.

- **Financing of training offers from professional associations, non-profits and private sector**

Expenses related to professional training for the unemployed and jobseekers are supported for the state budget. People registered as unemployed or who have received a pink slip can take part in workforce training.[76] The training is held as training groups ordered through the Unemployment Insurance Fund's procurement procedure. In fields where the Unemployment Insurance Fund does not order separate training groups, unemployed have the possibility of choosing a training suited to their speciality from among the ones offered publicly. The participation is financed by way of personal training plan directly to the training supplier. Unemployed who received in-service or retraining are paid a small stipend from the state budget in addition to having their training costs covered. The stipend is 3.84 euros per day. They are also paid transport assistance of 0.1 euros per km to reach training. The workforce trainings and training plan are co-financed from the ESF from the framework programme "Increasing supply of qualified workforce 2007–2013". Participation of the unemployed in the professional study is rising. In 2011, 17% of registered unemployed took part in the trainings. In previous years the participation rate was under 10%.[77] The share of the construction field in training activity applied as a labour market measure is minor - only a few training programmes, and this in a situation where 10% of the registered unemployed have noted construction as a previous area of activity.

Training for target groups vulnerable on the workforce market is financed through other ESF measures as well – for instance, SA Innove's qualified workforce supply project competitions, ARIB rural population activation projects. Training projects funded via ESF measures are aimed at the unemployed, at people who are inactive on the job market for various reasons and employees who are in danger of dropping out of the labour market because they belong to a risk group (older people, non-Estonians, parents of young children, people with caregiver duties etc). Few of the projects include construction study, only a few in-service study programmes for construction workers and welder training can be listed.

Companies in the construction sector have applied for assistance for training specialists and personnel development projects from the various EU structural fund measures implemented by Enterprise Estonia. The Estonian Association of Construction Entrepreneurs has since 2005 received support for 14 training projects from the Enterprise Estonia-coordinated measure "Knowledge and skills development grant".

[76] Employment Services and Assistance Act, adopted 28 September 2005, RT I 2005, 54, 430. 1993; 74; 1054. https://www.riigiteataja.ee/akt/948752? leiaKehtiv

[77] Statistics from the Unemployment Insurance Fund on active workforce measures, http://www.tootukassa.ee/index.php?id=13524

Seven of them took place in Estonia and seven were study trips abroad.[78] The total value of the projects is 326,000 euros, and the receipts from the EU structural funds make up 50% of the total. The main topics dealt with are construction work management, complicated architectural solutions and new construction technologies. The target group of the trainings were people working on in construction companies at the level of manager or engineer or specialist; thus worker-level training has not received funding from Enterprise Estonia. Alongside the larger training projects, in 2007-2012 companies have also supported the measure "Development of knowledge and skills – training voucher". Only very few construction topics have thus far been supported as part of the training voucher, such as terms of construction contracts, issuer of building energy labels and building energy auditor training.

Companies' orders for group training or financing of employees' contributions depend largely on position. Training orders and financing are mainly aimed at engineering and technical personnel. **Studies at the worker level receive much less financing. The possibility of financing training is found for professions where legislation or regulation requires a certificate,** such as the slingers and machinery operator speciality. Entrepreneurs are more wont to finance training in fields where there is high shortage of workforce, such as for training welders.

There are no comprehensive data on volume and financing of training outside formal education as private training providers, non-profit associations and professional association are not required to report such data. It is very hard to gather information by way of surveys. Namely, companies say precise record keeping on training volume over a long term is too much work. **The training offered by the private sector predominantly is financed by undertakings or participants.** If a person pays for the training themselves, he has the right on the basis of the Income Tax Act to a tax refund for the amount spent on training, the prerequisite being that a training provider registered with the Ministry of Education has to be used. State financing for training organized by the private sector is not used. To a lesser extent, participants in a private training company's programme can to a limited extent use Enterprise Estonia's grants or the Unemployment Insurance Fund's personal training plan.

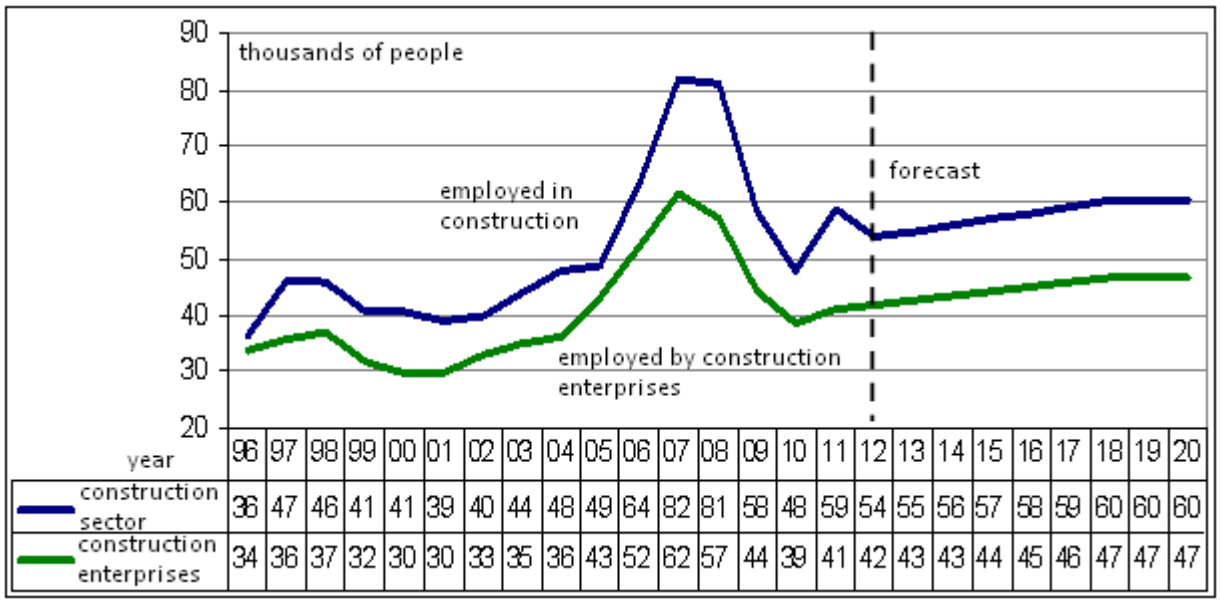
[78] Extract from the Enterprise Estonia grants database. http://www.eas.ee/et/eas/sihtasutusest/toetatud-projektid/toetatud-projektid-alates-2004a-aprill

7. Divergence between the current professional skills of the workforce and the levels necessary for achieving the 2020 objectives

This chapter lists the primary factors that impact the workforce market in the field of construction and evaluates their relevance in fulfilling the 2020 objectives. We emphasize that the evaluations ascribed to shortcomings in this chapter are tentative, and they will later be refined – especially as regards development of skills – in the next stages of the Build UP Skills project.

7.1. Development of the employment market in the construction field

The forecasts for 2012-2020 compiled on the basis of the overall numbers of people employed at construction companies indicate that the average number of the employed is 42,000-47,000 workers per year, which exceeds the average for the last 14 years but is lower than at the peak of the construction boom.[1] The forecasts made on the basis of volume of construction work and value added in the construction field indicate that the number of employed will be greater than this. Forecasts made on various assumptions show that the number of employed by construction companies could rise to 45,000-50,000 people or more.



year	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
construction sector	36	47	46	41	41	39	40	44	48	49	64	82	81	58	48	59	54	55	56	57	58	59	60	60	60
construction enterprises	34	36	37	32	30	30	33	35	36	43	52	62	57	44	39	41	42	43	43	44	45	46	47	47	47

[1] The forecast distinguishes numbers of all employed in the construction sector from those employed at construction enterprises, the project target group is employees in the field of construction.

Figure 7.1. Forecast as to the number of employed in the construction sector and by construction companies in 2012-2020 on the basis of the total number (thousands of people)[2]

The workforce study data signal an urgent shortage of workforce in the sector – close to one-half of companies (48%) said they needed one or more employees immediately – but they also point to high fluidity of the workforce. Workers leave to go to other construction companies or other work, go abroad or on pension. Compared to a similar survey from 2007, the responses point to an even greater shortage of workforce than in the pre-boom years. The working lifespan of the employees in the construction sector is shorter than overall – a factor that exerts a significant impact on supply of workforce. People retire from construction work predominantly before pension age, on average at 57.3 years. To replace the workers who leave due to age-related reasons, an average of 2.75% of construction workers must be found each year and 2.55% of new engineering and technical workers must be replaced each year. In other words, close to 3 percent of existing workers must be replaced each year. Various forecasts indicate that **935–1,075 new skilled workers will be needed in the construction sector already by 2012.** If in this decade, the growth in GDP proves to be just as successful as projections said it would, and the volume of construction work is at least 1,200-2,000 euros, there will be a need for workforce of up to 54,000 employees, which would be accompanied by a need for 1,200 workers who have acquired professional skills.

The following shortcomings have the most influence on the development of the employment market in the construction sector.

- In recent years, there have been 900-1,000 graduates per year in the construction field in vocational educational institutions. Yet we must take into consideration that admissions are down in 2010-2011, and thus the number of graduates in 2013 may be as low as 800. To ensure that the necessary replacement workforce is trained, admissions to vocational education must be increased significantly.

- On the basis of feedback from schools, 43 percent of graduates from vocational education find employment in their chosen speciality, and 15 percent of graduates go on to pursue further study. Of graduates in construction specialities in vocational educational institutions, 36 percent are not employed in work in their speciality or do not work for other reasons. **This fact may reduce the number of new hires to as low as 600, which is much lower than even the most conservative forecast for workforce needs in the sector.** Those who do not find work in the speciality are a very important potential workforce resource who could be brought back to the employment market in the field of construction through better cooperation between vocational schools and companies.

- The fluctuations on the Estonian construction market with regard to construction volumes are much greater than seen in neighbouring countries Finland and Sweden. The education system has a hard time responding to these sharp rises and falls, and thus the fluctuation also affects the employment of workers without speciality training. **According to workforce study data, construction workers who lack professional training account for close to 50 percent of workers at construction companies.** The statistics show that this percentage decreases during times of economic recession and rises as the

[2] Statistics Estonia, Estonian Institute of Economic Research calculations on the basis of the study ”Workforce-related situation of Estonian construction companies and prospective need for workforce”, May 2012.

economy grows. It is much harder to broaden the knowledge of untrained workers in the field of energy efficiency than it is in the case of those with speciality training. In addition, this group is characterized by very high turnover and high share of seasonal workers. There is a danger that the sector will continue to have a significant number of workers who lack the necessary know-how.

- **Pressure favouring the migration of workforce to neighbouring countries with a higher wage level is continuing at the current pace,** as convergence of wage levels is not realistic in the near future (1/3 of the workers who leave are headed abroad).

- **The ratio of training provided to engineering and technical personnel vs. workers is not based on the companies' needs**. Of the graduates from the construction and architecture specialities, **67% have acquired a worker-level qualification and 33% hold higher education**. For construction companies, a sustainable situation would be a case where a company has 2.5-3 construction workers per engineering and technical staff. A workforce study conducted by the Estonian Institute of Economic Research shows that the share of construction workers at companies that responded to the survey was much lower than the percentage of engineering and technical staff. Such a ratio is not sustainable in the longer term: companies will not be sufficiently efficient and the shortage of workforce will put pressure on them to hire people who lack specialist training. Increasing admissions to construction workers' vocational education up to the workforce replacement level would make the proportions of training more sustainable.
- There is a significant disharmony between expectations of construction companies and the actual fields in which higher-educated workforce are utilized. The greatest shortage of engineering-level employees is sensed on construction sites. At the same time, up to 40% of those who have acquired higher education in the construction field (with the share of those who have completed five-year integrated engineering studies) find employment at companies dealing with design, real estate development, planning activities, construction supervision, consultation or construction materials or equipment manufacturing and sale.

The following circumstances have the most influence on the workforce's awareness of energy efficiency.

- Companies' readiness to refer construction workers to training in the field of energy efficiency in the years ahead is much lower (53% of companies that responded) than the wish to refer engineering and technical personnel to such training (83 percent of respondents).[3]
- Of companies in the construction field, **95% are small and micro-enterprises,** whose ability to send employees to training is low; above all in the case of workers, resources cannot be found for covering training costs and preserving wages.
- Close to 50 percent of construction workers at construction companies have not received specialized training. As the number of new hires with specialized education is much lower than those leaving the employment market, **the share of employees who lack construction education will likely increase, causing the largest share of the need for skills in the field.** In general, no master-level specialists will be

[3] Estonian Institute of Economic Research study "Workforce-related situation of Estonian construction companies and prospective need for workforce", May 2012.

produced from the workers without specialized training. If workers who lack specialized training are also seen as a training target group, in-service training that deals narrowly with energy efficiency will not be sufficient here: it will be necessary to develop professional competences as a whole. To some extent the system is working, as those who leave the employment market enrol, through the Unemployment Insurance Fund, in long-term training for raising their level of qualifications. At the same time, the training activity is not preventive: the opportunity to identify risk groups before the employees drop out of the employment market is not taken, nor are the workers referred to trainings to prevent unemployment.

7.2. Skill requirements for construction workforce

Depending on the size of the company, one employee with master-level competence[4] is required per 6-10 construction workers; this master level employee is of key importance to ensuring work quality and energy efficiency. **The total number of construction workers at construction companies in the years ahead will be around 28,000. Based on this, the master-level training target group is 3,500 employees.** In the context of this project we treat the master level as the most important training target group. The distribution of the target group by speciality will be refined at the next stage of the project.

In the development of competences aimed at energy efficiency, the complementing of occupational standards in the construction field is of key importance, as these are the basis for updating the content of national curricula in vocational education as well as designing in-service trainings.

In connection with the transition to the eight-level qualification framework, the existing standards will be updated, and new ones will be added (see Annex 3). As the process is still ongoing, this is a good opportunity to determine the need to treat, at various qualification levels, competences related to the energy efficiency of buildings and to make proposals for updating the occupational standards. The point of departure here is to what degree the given competence (knowledge, skills, attitudes) in the specific occupational standard may influence the energy efficiency of the building or of the construction process. The higher is the occupational qualification level, the more wide-ranging the energy efficiency-related competences will have to be. Currently a list has been set forth of the groups of competences that need to be significantly updated in later stages of the project in cooperation between the BuildEst working group, target group representative and occupational qualifications committee members.

7.2.1. Determination of energy-efficiency-related competences and introducing such competences into occupational standards

Level III and IV qualifications for construction workers in the EstQF

[4] We consider master level competences to be the skills of supervising construction workers with lower qualifications and of conveying professional skills and knowledge, and the readiness to take responsibility for organization of work, use of materials and outcome of work.

Considering that level III and IV construction workers do not take part in designing buildings, managing construction work and advising customers and contracting entities, their influence on building energy efficiency is manifested through quality performance of construction work using the proper technological process.

To ensure this, the necessary competences must be introduced into occupational standards and from there on, vocational training curricula must be provided with corresponding modules that deal with the selection of tolerances and technologies and techniques as well as the potential influence of construction faults on energy expenditure of the construction process and buildings' energy efficiency.

For instance, with regard to all of the most important components, occupational standards should direct both formal education and in-service training to treating the following topics:

- organisation of construction work;
- typical faults in construction work and their causes;
- primary manifestations of construction faults and the thermal physical impact on structures and buildings' energy efficiency;
- how the selection of construction work technologies influences the environment and the energy expenditure of the construction process.

It would be wise to use a simulation programme to demonstrate the impact of construction faults on buildings' basic structural elements.

The energy efficiency related competences noted here level III and IV qualifications for construction worker need to be significantly refined in cooperation with representatives of target groups and members of occupational qualifications committees in the subsequent stages of the project BuildEst.

Level V qualifications for construction workers in the EstQF

The level V construction worker qualification is a construction master level, which includes, in addition to construction worker know-how, certain management related competences. When managing construction processes in this extent, a construction master has greater opportunity to impact the energy efficiency of buildings.

In addition to the competences described in the level III and IV qualifications, the master of construction qualification should also include

- general knowledge of energy sources and energy types and principles for selecting them;
- general knowledge of the combined effect of technical utility systems and building structural elements on building energy efficiency.

The energy efficiency related competences noted here for level V qualifications of construction worker need to be significantly refined in cooperation with representatives of target groups and members of occupational qualifications committees in the subsequent stages of the project BuildEst.

Construction manager V[5]

The holder of these qualifications is a mid-level manager who, in addition to the ability to manage certain construction processes, has project management competences for buildings of limited size and complexity. He/she can also perform supervision for the building owner. As the construction manager has a markedly greater scope of responsibility in the construction process than construction workers, he/she can impact the energy efficiency of the building or process much more. For this reason, the following energy efficiency related competences must be added to the occupational standard for construction manager:

- general knowledge of energy sources and energy types and principles for selecting them;
- general knowledge of the combined effect of technical utility systems and building structural elements on building energy efficiency;
- knowledge of legislative acts, regulations and standards pertaining to energy efficiency.

The energy efficiency related competences noted here for the construction manager qualifications need to be significantly refined in cooperation with representatives of target groups and members of occupational qualifications committees in the subsequent stages of the project BuildEst.

Engineering level qualifications (EstQF levels VI-VIII)

For engineers, cross-disciplinary competences are important for achieving building energy efficiency, e.g.:

- thorough knowledge of the combined effect of technical utility systems and building structural elements on building energy efficiency;
- impact of building design on their energy efficiency; associations between design, construction and management based on energy efficiency.

The general approach to the construction engineer qualifications will be refined in cooperation with representatives of target groups and members of occupational qualifications committees in the subsequent stages of the project BuildEst. They must agree on how to describe skills pertaining to energy efficiency. The precise wording of the necessary skills is not the goal of the project; the sector skills councils deal with the more detailed definitions by each speciality in the course of updating the occupational standards.

7.3. Training for raising qualifications and areas of activity which lack training opportunities

[5] EstQF level 5, which in the new occupational standards has been brought into conformity with the eight-level qualifications framework in the new occupational standards, is titled „Construction Manager III" in the currently valid occupational standards.

This section presents the existing training opportunities with regard to qualifications and specialities in the focus of the BuildEst project. This is the preliminary information for the next stages of the project, where it is possible to analyze ways of conveying knowledge on energy efficiency in the framework of raising qualifications and highlighting the development needs.

Table 7.1. Training opportunities for acquiring higher qualifications

Profession	Qualifications level III	Qualifications level IV	5. Qualifications level V
Construction manager	None	None	General in-service training programme (64 hours) in the field of construction management
Concrete worker	Course load at vocational educational institution 40–80 weeks of study* depending on previous educational level	Opportunities for formal education as at previous level, in-service training programmes volume 50-320 hours	With regard to qualifications level V of construction master, basic training being developed for construction work master level, ca 80 hours
Bricklayer	Course load at vocational educational institution 40–80 weeks of study depending on previous educational level	Opportunities for formal education as at previous level, in-service training programmes volume 50-95 hours	
Assembler	No separate curriculum for vocational education, no in-service training plans, currently training on the job	No in-service training opportunities, training on the job	
Mortarer	It is possible to acquire professional skills, by passing the construction finishing speciality curriculum at the vocational training level. Course load 80 weeks of study (40 weeks in the case of the painter and tile installer component skill curricula)	Opportunities for formal education as at previous level, in-service training programmes volume 60-120 hours	With regard to qualifications level V of finishing master, a management basic training is being developed for the master's level of construction work with a load of about 80 hours
Painter			
Tile installer			
Roll floor material installer		No in-service training opportunities, training on the job	
Carpenter	Course load 80 weeks of study at vocational educational institution	Opportunities for formal education as at previous level, in-service training programmes with a load of 60-160 hours	With regard to qualifications level V for master carpenter, basic training being developed for construction work master level, ca 80 hours
Flat roofer	No separate curriculum at vocational education level, no in-service training curricula, training on the job	No in-service training opportunities, training on the job	None

*One week of study is calculated as 40 hours of work in any form done by the learner.

Sheet metal worker	No separate curriculum at vocational education level, some small in-service training curricula, training mainly on the job	Some in-service training curricula with a load of 56–100 hours, training on the job	None
Potter	No separate curriculum, covered as a component skill in bricklayer curricula, several in-service training programmes with a load of 60–360 hours	Several in-service training programmes with a load of 60–360 hours	No opportunity for in-service training for acquiring qualifications level V in potter
Electric welder	No independent curriculum, module in the plumber curriculum with a load of 3 weeks of study, need to add it as an elective to other construction specialities' curricula	In-service training programmes with a load of 120 hours exist	None
Heating system technician	Possible to acquire the relevant skills at the vocational education level by completing the plumber curriculum with a load of 80 weeks of study (40 weeks of study for ventilation technician component skills)	Formal education possibilities as on the previous level, some in-service training programmes with a load of 40 hours	With regard to qualifications level V of plumber, a management basic training is being developed for the master's level of construction work with a load of about 80 hours
Water works and sewerage technician[**]			
Ventilation technician		No in-service training opportunities, training on the job	

[**] The name of the the water supply and sewerage technician profession has yet to be finalized.

7.4. Training providers

Different training providers who are in competition against each other operate on the market for training in the field of construction. **Estonia does not have a central training institution in the field of energy efficiency.** We are seeing the beginnings of oversupply of beginner level courses in energy efficiency; there are a great number of similar introductory courses and smaller information events. To develop comprehensive trainings, cooperation between training providers is recommended. This would make it possible to reach a larger number of students, achieve more thorough specialization in training topics and create exhaustive training programmes.

The vocational educational institutions that teach construction specialities also serve as the providers of in-service training on the worker level. The key question with regard to developing training capacity of vocational educational institution in the field of energy efficiency is training speciality teachers. The training target group size is an estimated 70 vocational teachers. It is a good idea to involve people from the private sector in the teaching, for instance as prospective co-lecturers. Small groups are suitable for training trainers, where the key role is on practical discussion and preparing assignments and materials that can be used to integrate energy efficiency topics into study programmes. In cooperation with representatives of vocational teachers, the topics, number of groups and participants in the training will be specified in the operational plan for the BuildEst project.

Training of trainers requires flexibility, which will allow people's work experience or previous training to be taken into account, and help to rectify deficits in the knowledge of teachers who lack technical higher education (e.g. allowing certain subjects to be studied through informal studies offered by institutions of higher education).

Vocational schools may need help from companies in dealing with specific topics (such as regulation of heating and ventilation systems and equipment etc). Private sector specialists should be brought on to introduce more specialized knowledge to the in-service trainees. In subsequent stages of the project, it should be determined whether vocational schools need assistance from private sector lecturers directly in the teaching work or for obtaining guidelines for selecting study materials and methodology.

The analysis and evaluation of the treatment of energy efficiency topics in vocational education will henceforth be performed by representatives of professional association upon accreditation of vocational training. One development opportunity is to specify in detail the methods for evaluating in-service training as one area of activity in the vocational education accreditation system. This field is currently not getting the attention it deserves. In addition, professional associations in the construction field can direct state-commissioned education planned by the Ministry of Education to in-service training as well, as coordination with professional association is set forth as part of this process. Both educational institutions and professional associations can seek an increase in the number of trainings dealing with energy efficiency.

The situation that has developed in Estonia is that trainers in the field of energy efficiency are concentrated at institutions of higher education. Professional associations, too, have experts in specific fields, but it is predominantly experts from universities who are in the role of carrying out trainings organized by training enterprises or professional associations. To train workers, knowledge in the field should move outside universities. Universities and professional institutions of higher education take part actively in describing skills and competences related to energy efficiency. **In disseminating knowledge to construction workers,**

the role of a university or institution of professional higher education can be to train trainers, serve as a clearinghouse for international experience and develop textbooks and methodologies. In building training capability at vocational schools, experts from universities can be a help, but it is not realistic that they would be able to take on the entire training load needed.

Cooperation between bodies that award qualifications and training providers – with the purpose of ensuring closer linkage between studies and qualification requirements – is indispensable. At the level of higher education and professional higher education, this cooperation is taking place effectively. Representatives of professional associations are generally involved in the process of developing training programmes, or the programmes are submitted to them for evaluation. With regard to in-service training offered by vocational schools, cooperation with awarders of qualifications – the latter being the coordinators and certifying instances for the programmes – is mostly lacking. With private sector training enterprises, such cooperation takes place only to a limited extent. The in-service training plans for adults should conform better to the national formal education curriculum modules as they are based on the occupational standards in the field and descriptions of qualification component and have been reviewed and evaluated by experts in the course of vocational training accreditation.

In the study, 13 **private training providers**, including all of the largest ones in the field, expressed readiness to organize trainings in the field of energy efficiency. With regard to target groups, the providers were significantly more ready to train engineering technical staff than construction workers. Six of the companies that responded said they were prepared to train workers. **Cooperation with private training enterprises can best be coordinated by the professional association, and to do so, training enterprises must be encouraged to coordinate their training programmes with the professional association.**

The practice of construction firms allowing an employee to provide training internally is not very common but this training format has been used with regard to electrical safety, fire safety and working environment requirements. Mainly, external teachers are invited – from an educational institution, professional association, training or consultation provider – and the local representative provides only limited support, sharing specific information with the company.

Developing companies' internal training capability is one possible measure for increasing energy efficiency. Yet their readiness for this, the existence of potential teachers and the size of the target group at the company must all be determined in more detail.

7.5. Monitoring of workforce needs and competences aspiring toward energy efficiency

- **National forecast of need for workforce**

At the national level, the need for workforce is tracked via the forecast compiled by the Ministry of Economic Affairs and Communications. It evaluates possible developments on the workforce and need for new employees from the quantitative aspect – how many more employees are needed in various areas of activity, in groups of professions and at educational levels. The forecast is aimed first and foremost at the Ministry of Education and Research and is one tool for compiling the request for state-commissioned education.

With regard to use of workforce, systematic monitoring at the national level exists through the workforce need forecast. At the same time, the monitoring activity could be much more informative for the construction sector. For instance the forecast does not distinguish need for workforce at the worker and engineer level, nor does it specify the area of activity of employees in the construction field, as a result of which it is quite complicated to make education decisions on the basis of the forecast.

- **Monitoring changes in requirements for various qualification levels' skills and knowledge**

In developing the qualifications system, the descriptions of skills and knowledge required of workforce are monitored and updated as needed. At the same time, the updating process depends significantly on the capacity of the relevant professional association and is very different from one field to the next.

Statistics on qualification examinations allows the scope of the knowledge first-level qualifications to be tracked and, based on this, makes it possible to compile proposals for educational institutions. With regard to higher-level qualifications, there are too few applicants for qualifications to allow conclusions to be drawn. If more use begins to be made of basic or specialized skill testing in the application for qualifications – as planned in the field of energy efficiency at the engineer level, for instance – this would be a significant additional opportunity to track changes in the level of the knowledge of applicants for qualifications in the construction sector.

- **Monitoring in the educational system**

In developing its request for state-commissioned education, the Ministry of Education and Research proceeds from the workforce forecast compiled by the Ministry of Economic Affairs and Communications as well as from data gathered from professional associations and schools. No long-term forecasts are made with regard to state-commissioned education. The planning term is up to 3 years, and the forecast is corrected in the interim.

National curricula are updated based on updates to the occupational standard. If there is no occupational standard in a given field, the basis for the update is regular negotiations with employers. The educational institution is responsible for ensuring conformity of study content in the higher education curricula to employers' needs.

- **Role of the professional associations in mapping and monitoring the construction sector**

The construction sector's own initiative in tracking changes is very important. Information from the sector's representative organizations is elicited by the Ministry of Education and Research for planning state-commissioned education as well as by educational institutions for refining the content of curricula. In the qualifications system, the professional associations are mainly in the role of issuer of professional certification. Manifestations of the monitoring activity that has taken place to this point include commissioning research studies (Estonian Association of Construction Entrepreneurs), launching the training committee (Estonian Association of Heating and Ventilation Engineers), gathering workforce data on members in order to compile annual overviews and exchange of information with members. The monitoring conducted at the sector's own initiative could certainly be more systematic (comparative data from different organizations) and more regular (annual collection of basic data, more comprehensive workforce studies every two years). The role of professional associations is especially important in setting forth new skill levels and qualifications that need to be developed. The work of the sector skills council in connection with new qualifications is launched on the basis of proposal of the professional association.

Professional associations have a number of means of monitoring and influence for developing the supply of in-service training. With regard to more comprehensive training programmes aimed at applicants for qualifications, training providers have been given an opportunity to coordinate them with the professional association in the process of development and to valorize them using in-service training points. Training enterprises are interested in gaining a competitive edge on the market, while professional associations can more easily make decisions on the relevance of training with regard to applications for qualifications. Yet this coordination process is inconsistently regulated in professional associations and each one has developed its own methods of analyzing programmes.

- **Monitoring skill levels at companies**

The broader use of certified quality control systems in companies will also bring greater order to activities aimed at personnel development. In large and medium-sized companies, analysis of employee skills is performed, and thus training needs are fairly well mapped out. At the same time, companies depend to a large degree on the selection offered by the education system and training enterprises, as usually there will be a shortage of employees in a given field to offer training in a narrow speciality to just one company. Information on training needs could be conveyed to training providers in consolidated form via the professional association.

8. Obstacles

To determine potential obstacles to developing the field of energy efficiency, the project working group analyzed the situation at various levels. General obstacles were highlighted as well as ones characteristic of the construction sector, educational system and training activity.

General

- Insufficiency of long-term planning in the sector

  Long-term planning of state energy resource management takes place ("National development plan for the energy sector up to 2020"), but only a limited amount of similar planning is seen in the construction sector with its variable market.

- Fragmentation of activities in the field of energy efficiency

  Development plans of public sector institutions (MEAC, KredEx, DF, TSA) are uncoordinated and responsibility is unclear.

- Statistical databases (renovations, savings to be gained, workforce statistics) are inexact/inaccurate

  Very difficult to unify statistics gathered by different government institutions for drawing conclusions: the fundamental grounds on which data are gathered are too different. There is a lack of more detailed analysis and a jointly administered database in the field of energy efficiency.

- Financing risk

  High dependence on EU aid measures in seeking energy efficiency. With regard to the size of financing measures from structural funds in the period 2014–2020, the opinion has been aired in Estonia that allocations greater or equal to the previous period are necessary (ca 4.05 billion euros). The amount of allocations to the construction sector is not currently known.

Construction sector

- Fragmentation of the construction sector

  Most workers are employed by small and very small companies that are not capable of developing their personnel in a systematic fashion. No strong small business climate has developed in the sector. The more capable companies are project management firms, but these lack interest in developing the corps of workers.

- Weakness of the social partnership system

  Due to the lack of trade unions in the construction sector, professional associations have weak capability compared to countries where the field is well-organized and information is disseminated through social partnership. The role of unions has been to train employees and coordinate training.

  A hindrance to founding trade unions may be fear of negative influence on the open economic system.

Formal education

- Decrease in the number of learners/students

  The drop in the number of students in the last few decades stems from the demographic situation. The popularity of construction specialities also depends on changes in the economic climate.

- High dependence of development activities on EU funding

  Most development activities take place with ERDF and ESF funding, which renders ensuring sustainability of activities problematic.

- Insufficient funding of tuition expenses

  Considering the share of practical instruction in the construction field and the high requirements for supply of materials and tools, the funds channelled into construction study are not enough to implement the first-level curriculum at the level expected by employers.

- Lagging study content and methods

  There is insufficient utilization of up-to-date study and evaluation methods in the studies, vocational teachers are not conversant enough with new technologies and materials.

- The actual content of practicum work is not in harmony with the objectives of the curriculum

  Cooperation with companies in the region for ensuring professional placement slots is insufficient, content of such practicum work does not ensure achievement of the expected study outcome.

- Too little cooperation with employers

  Minimal involvement of specialists in the study process.

- Workload on vocational teachers

  The workload of vocational teachers as measured in academic hours is high or unevenly distributed and does not make it possible for them to take part in development activities. The substantive qualification of teachers lags behind the rapidly developing working world.

- Distribution of vocational teachers by age

  Training of new young teachers is low, jeopardizing sustainability of speciality training and the conformity of study to what the economy and labour market need.

Training activity

- Low number of competent experts for training trainers

  Shortage of experts who are capable of training trainers at the expected level. The existing experts have no incentive to carry out the training.

- Low number of potential participants in training of trainers

  This is influenced by the insufficient number of vocational teachers and their advanced average age, low number of those who have actively conducted in-service training for experienced employees. Few specialists in the private sector who are motivated to work as a trainer.

- Shortage of study materials

  Shortage of study materials, few publications that make independent study possible. Few competent authors and they have limited time resources. No funding ensured for developing textbooks and acquiring copyrights.

- Lack of interest in knowledge-based construction

  Low interest on the part of construction entrepreneurs in development activities and topics that offer a broader view. Doubts as to whether local experts have enough new information to convey, yet no interest in the broader mindset offered by international experts. On one hand, low interest from entrepreneurs, and on the other hand, lack of experience in implementing innovative solutions and generating value added.

- Limited access to trainings on the part of small and micro enterprises

  Training and information offered at the vocation training level does not reach those who need it the most, i.e. employees of small and micro enterprises. The content and target group of training organized on the basis of state-commissioned education or ESF are largely determined by the educational institution or the training enterprise itself, often not proceeding from the companies' needs but instead on what the education institution or training company is capable of offering.

9. Conclusions

The results of the survey conducted by the Estonian Institute of Economic Research in the course of preparing this report showed that nearly one-half of the surveyed construction companies (48%) would immediately need additional employees (workers or civil engineering-technical personnel), which indicates a shortage of workforce in the construction sector. At the same time, nearly 50% of the construction workers employed by construction companies do not have professional education. The proportion of workforce with education in the field of construction is decreasing, as the number of young people entering the labour market from the education system is smaller every year. However, in the case of a low replacement rate of educated workforce there is a risk that the construction sector will have a large proportion of workers without the necessary know-how, which in turn will affect the construction quality.

In order to reproduce the necessary educated workforce, admissions to vocational schools should be significantly increased. 36% of the graduates of construction specialities from vocational education institutions do not take up employment in their area of speciality or do not work for other reasons. Those who do not start work in their area of speciality are a very important potential workforce resource, who could be brought back to the labour market in the field of construction through better cooperation between vocational schools and companies. The migration of skilled workers to neighbouring countries with a higher wage level (Finland, Norway etc) is an important influencing factor. The result is an increasingly acute shortage of professional workforce in Estonian construction companies. That tendency will continue at its current pace also in the future, as convergence of the wage levels of those countries and Estonia is not realistic in the near future.

According to this analysis, the ratio of training provided to engineering and technical personnel vs. workers is not based on the companies' needs. Of the graduates from the construction and architecture specialities, 67% have acquired a worker-level qualification and 33% hold higher education, which means that the proportion of workforce with higher education is too large. Increasing admissions to construction workers' vocational education up to the workforce replacement level would make the proportions of training more sustainable. In addition, there is a significant disharmony between expectations of construction companies and the actual fields in which higher-educated workforce are utilized. The greatest shortage of engineering-level employees is sensed on construction sites, while graduates instead prefer project management, construction design or consultation companies.

Considering the continuing increase in the housing stock deficit in Estonia and the European Union energy policy targets for 2020, we can project structural transformation in the construction sector in the near future. Changes in general regulatory acts, upgraded construction technologies and materials and changes in energy supply strategies condition new requirements for training and work-related organization of those operating in the construction sector.

It is much harder to broaden the knowledge of untrained workers in the field of energy efficiency than it is in the case of those with speciality training. If workers who lack specialized training are also seen as a training target group, in-service training that deals narrowly with energy efficiency will not be sufficient here: it will be necessary to develop professional competences as a whole. In the context of this project,

the most important training target group is a master-level employee (approximately 3,500 employees), who is capable of instructing construction workers with lower qualifications and passing on professional knowledge and skills and is prepared to take responsibility for organisation of work, use of materials and work results. We also follow the principle that the higher the occupational qualification level, the more wide-ranging the energy efficiency-related competences will have to be. The distribution of the training target group by specialities will be specified in the next stage of the project.

In the development of competences aimed at energy efficiency, the complementing of occupational standards in the construction field is of key importance, as these are the basis for updating the content of national curricula in vocational education as well as designing in-service trainings. In connection with the transition to the eight-level qualification framework, the existing standards will be updated, and new ones will be added. As the process is still ongoing, this is a good opportunity to determine the need to treat, at various qualification levels, competences related to the energy efficiency of buildings and to make proposals for updating the occupational standards in the next stage of the project. The point of departure here is to what degree the given competence (knowledge, skills and attitudes) in the specific occupational standard may influence the energy efficiency of the building or of the construction process.

The topics of energy conservation and building energy efficiency are not directly covered in the national curriculum and thus there is no overview of how much and what topics related to energy conservation and energy efficiency are dealt with during study. That is why cooperation with higher educational institutions is very important for promoting the field, as is preparing textbooks and guidelines and developing study methodology. To a limited extent there are subjects aimed directly at energy efficiency in all of the curricula of the construction field and at all levels of study. There are the most of them in the energy efficiency master's curriculum of Tallinn University of Technology. To increase the quality of academic work in this area, it will be necessary to develop a single set of standards as to how themes will be treated, sample materials, and functions for use for all teachers related to the topics.

A lack of qualified trainers is also a keenly felt problem. This is a field which the cooperation network established in the course of this project could address as part of continuing activities, creating contacts for bringing international trainers to Estonia and opportunities to develop local training capacity and developing the lecturer skills of practicing experts. The key question with regard to developing training capacity of vocational educational institutions in the field of energy efficiency is training speciality teachers (estimated size of the training target group is 70 vocational teachers). In cooperation with representatives of vocational teachers, the topics, number of groups and participants in the training will be specified in the next stage of the project. The role of a university or institution of professional higher education would be to train trainers, serve as a clearinghouse for international experience and develop textbooks and methodologies. Developing companies' internal training capability is one possible measure for increasing awareness of energy efficiency. The readiness of the companies who participated in the survey conducted by the Estonian Institute of Economic Research to educate employees and cooperate with the educational system (establishing contacts with schools and recruiting workforce from schools) creates good preconditions for the implementation of the next project activities.

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Annexes

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[2]The formal education qualifications in national qualifications framework. Estonian Qualifications Authority.
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ANNEX 1. **Measures for implementing energy conservation policy for buildings**[1]

LEGAL ACTS IN THE RESPECTIVE FIELDS

NAME	Minimum requirements for energy efficiency	Requirement that buildings and parts thereof have an energy label when being sold or rented, requirements for disclosure of energy	Requirement that buildings over 1000 m^2 have an energy label (from 2013 – 500 m^2, and from 2015 (in public buildings) – 250 m^2)
Status	Measure to be implemented	Measure to be implemented	Measure to be implemented
Implementation period	The regulation entered into force on 1 January 2008 (updated at least every 5 years)	Effective 2009	Effective 2009
Target group/ scope of application	All new and significantly renovated buildings	All buildings and parts thereof that are leased or sold	Public sector and publicly accessible buildings
NAME	Determining central suppliers for public procurements	Advising consumers upon purchase of hot water heaters, air conditioners, and heat pumps	Developing guidelines and/or rules for implementing individual expense accounting
Status:	Planned measure	Measure to be implemented	Planned measure
Implementation period	2012	Legislation entered into force on 1 October 2010 (the legislation will be updated in 2013: equipment must be registered with the National Building Register)	2012
Target group/ scope of application	Public sector (state)	Owners of hot water heaters, air conditioners and heat pumps	Implementers of individual expense accounting systems

GRANTS AND OTHER SUPPORT

NAME	Renovation loan for apartment buildings programme ("Operational Programme for Development of the Living Environment ")	Support for renovation of apartment buildings	Support for renovation of apartment buildings
Status	Programme to be implemented	Measure ended	Programme to be implemented
Implementation period	2009–2015	2003–2009	2010–2014
Budget in millions of €	49	8.3	24.2
Target group/ scope of application	Apartment associations, building associations and associations of apartment owners	Apartment associations, building associations and associations of apartment owners	Apartment associations, building associations and associations of apartment owners
NAME	Implementation of the public sector building renovation programme.	Programme for issuing regional investment grants from gambling tax	Local public services development
Status:	Programme to be implemented	Programme to be implemented	Measure to be implemented
Implementation period	2011–2012	Effective 2007	2004–2015
Budget in millions of €	146.5	1	88
Target group/ scope of application	Public sector	Local governments, non-profits (public sector)	Local governments (public sector)
NAME	Updating the study environment for vocational educational institutions	Updating open youth centres, information and counselling centres and hobby schools	Development of health and welfare infrastructure
Status	Measure to be implemented	Measure to be implemented	Measure to be implemented
Implementation period	2007–2015	2007–2015	2007–2015
Budget in millions of €	150	25	175
Target group/ scope of application	Public sector	Local governments (public sector)	Public sector
NAME	Developing principles for an energy-efficient renovation assistance scheme and establishing the assistance scheme	Providing state guarantees for energy-efficient construction and renovation	Preliminary studies for modernizing street lighting and analysis of financing opportunities
Status:	Measure to be implemented	Planned measure	Planned measure
Implementation period	2012–2014		2012
Budget in millions of €	4		
Target group/ scope of application	Owners of private houses	Owners of buildings, not including public sector	Public sector

[1] http://ec.europa.eu/energy/efficiency/end-use_en.htm

TAX POLICY

NAME	Stimulus for gathering starting capital needed for investments	Tax exemption on interest on housing renovation loan
Status	Planned measure	Measure to be implemented
Implementation period	2014	Effective 2002
Budget in millions of €		1
Target group/scope of application	Owners of buildings	Owners of buildings

PROVIDING KNOW-HOW

NAME	Preparing and implementation of an action plan for training workforce in the field of construction	Providing know-how to engineers and architects	Providing enrichment opportunities and know-how to energy auditors
Status	Measure to be implemented	Planned measure	Planned measure
Implementation period	2011–2013	2012	2012
Budget in millions of €	0.3	0.05	
Target group/scope of application	Workers in construction, teachers at vocational educational institutions	Engineers, architects	Energy auditors
NAME	Notifying local government regarding regulations on Building energy efficiency	Increasing expertise of building administrators	Performing energy audit and building expert inspection and supporting preparation of building design
Status	Planned measure	Planned measure	Measure to be implemented
Implementation period	2012		2008–2013
Budget in millions of €	0.1	0.05	1.6
Target group/scope of application	Local government officials	Specialists engaged in building management	Apartment associations, building associations and associations of apartment owners

NAME	Building design and construction super-vision grant for apartment associations for preparing extensive renovation
Status	Measure to be implemented
Implementation period	2011–2012
Budget in millions of €	0.8
Target group/ scope of application	Apartment associations, building associations and associations of

RESEARCH AND DEVELOPMENT

NAME	Construction of model buildings in local governments pursuant to the standard for low-energy buildings	Specifying certification procedures for conformity to minimum requirements and developing aids	Developing energy audit methods
Status:	Measure to be implemented	Planned measure	Planned measure
Implementation period	2012–2015	2012	
Budget in millions of €	6	0.25	
Target group/ scope of application	Local governments (public sector)	Those performing energy calculations regarding buildings, policy planners	Energy auditors, policy planners
NAME	Implementation of projects based on energy conservation agreements and developing supply of energy services	Establishing near zero energy buildings as model objects	Implementation of projects based on energy conservation agreements and developing supply of energy services in public sector
Status:	Planned measure	Planned measure	Planned measure
Implementation period	2013	2014	2012

KNOWLEDGE

NAME	Programme entitled "Notification of inhabitants regarding energy conservation "	Raising the contracting entity's awareness, green public procurements	PR work among public sector leaders and officials dealing with building management
Status:	Measure to be implemented	Planned measure	Planned measure
Implementation period	2008–2012		
Budget in millions of €	0.6		
Target group/ scope of application	Building owners, apartment associations	Public sector	Local government officials

NAME	Advising local governments in planning development of the energy sector and other related fields
Status:	Planned measure
Implementation period	2012
Target group/ scope of application	Public sector (local governments)

ANNEX 2. **Position of formal education qualifications in Estonian qualifications framework**[2]

Formal education qualifications	EstQF levels
Basic education certificate based on curriculum for students with moderate and severe learning disabilities	1
Basic education certificate based on simplified curriculum Basic education certificate VET without basic education requirement certificate	2
VET based on basic education certificate	3
Upper secondary general education certificate Upper secondary VET certificate VET based on upper secondary education certificate	4
Diploma of Bachelor's degree Diploma of professional higher education	6
Diploma of Master's degree	7
Diploma of Doctoral degree	8

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[2] http://www.kutsekoda.ee/en/kvalifikatsiooniraamistik

ANNEX 3. **Occupational qualifications in the field of construction**

Occupational area	Occupation	Proposal for subdividing the occupation	Valid occupational standards	New occupational standards (brought into conformity with the eight-level Estonian qualification framework)		
				EQF level 3	**EQF level 4**	**EQF level 5**
CONSTRUCTION	Construction management	Construction management	Construction manager III			Construction manager V
	General construction	General construction	Concrete construction builder I; II; III	Concrete construction builder III	Concrete construction builder IV a/IV	Master builder V
			Bricklayer I; II; III	Bricklayer III	Bricklayer IVa/IV	
			–	Assembler III	Assembler IVa/IV	
		Finishing	Finishing worker I; II; III	Plasterer III	Plasterer IVa/IV	Master finisher V
				Painter III	Painter IVa/IV	
				Tile installer III	Tile installer IVa/IV	
				Roofer/floor installation specialist III	Roofer/floor installation specialist IVa/IV	
		Carpentry work	Bricklayer I; II; III	Carpenter III	Carpenter IVa/IV	Master carpenter V
		Specialized construction	–	Flat roofer III	Flat roofer IV	–
			Construction sheet metal specialist I; II; III	Sheet metal specialist III	Sheet metal specialist IV	–
			Potter I; II; III	Potter III	Potter IV	Potter V
			–	Electrical welder III	Electrical welder IV	–
	Environmental technology	Environmental technology	Plumber I; II; IIII	Heating system technician III	Heating system technician IVa/IV	Master environmental technician V
				VK* technician III	VK* technician IVa/IV	
			Ventilation technician I; II; III	Ventilation technician III	Ventilation technician IVa/IV	

The third-tier construction worker occupational standards are the basis for developing national curricula. As schools are becoming awarders of first-tier occupational qualifications, one possible development scenario is as follows. Graduates have acquired vocational secondary education and also receive their IVa level occupational qualifications, which are first-level qualifications on the job market. For instance, those who study in general construction can receive three first-level qualifications: concrete structure builder, bricklayer and assembler. As a rule, school graduates specialize in one profession upon entering the job market (e.g. starts work as a bricklayer). If they have worked for two years as a bricklayer and attained professional status, and passed trainings in the field of entrepreneurship and energy efficiency, it will be possible for them to apply for level IV occupational qualifications from the awarder of occupational qualifications. Under the Building Act, level IV qualifications give initial-level competence, meaning that the person can act as a sole proprietor in the extent of his or her professional competence or register his or her company in the Register of Economic Activity only in his or her area of competence (bricklayer). The holder of level IV occupational qualifications generally works independently and supervises lower-ranking workers within the constraints of their competence. Construction workers who have all of their initial professional area plus one level IV occupational qualifications and who have passed leadership training have the right to apply for master's qualifications (such as master builder V). Master level can be termed mid-level manager with the competence to supervise, within the bounds of their occupational areas, crews or groups of workers in various work segments. In the sense of the Building Act, master qualifications confers the right to obtain a registration as a responsible specialist and register a company in one's professional area in the Register of Economic Activity

Persons who apply for occupational qualifications straight from the job market and do not have vocational education in a given area can apply for level III occupational qualifications as their first-level qualifications, which does not require vocational secondary education or secondary education in addition to the level III competences described in the occupational standard.

The occupational qualifications of a log house builder I, II and III, which are currently in the forestry field, will soon be transferred to construction. In the course of the transition to eight-level qualification framework, the log house builder IV qualifications will be added. Also under consideration is establishing a fifth qualification level for log house construction either as a separate qualification level or a part of construction manager V.

* The name of the water and sewerage field is still being decided on.

ANNEX 4**. Legislation governing the field of adult education**

- The Adult Education Act, which sets forth the fundamentals of adult training and legal guarantees for desired study throughout one's lifetime.
- The Vocational Education Institution Act and Minister of Education and Research Regulation no. 66 of 29 October 2007 enacted thereunder, "Conditions and procedure for organizing adult vocational training at vocational education institutions". According to the regulation, a vocational educational institution may organize adult vocational training in the fields it teaches. If the material basis and teachers conforming to the qualification requirements exist, the institution may organize training in other fields.
- The Professional Higher Education Institution Act governs full-time, part-time study and study by external students, as well as consideration of previous work and educational experience. The act gives the education institution's board the right to specify the fields, forms and procedure of providing vocational training for adults.
- The Universities Act governs full-time, part-time study and study by external students, as well as consideration of previous work and educational experience. The act gives the university's board the right to approve the fields, forms and procedure for vocational training.
- The Private Schools Act governs establishment and operations of private schools. According to the act, all legal persons under private law that offer more than 120 hours or six months of study per year must form a private school and apply for an education licence.
- Regulation no. 1 of the Minister of Education and Research of 11 January 2010, "Procedure for preparing SCE in vocational training in the area of government of the Ministry of Education and Research" and directive no. 85 of the Minister of Education and Research of 1 February 2011, "Establishing the basic cost per learner of one contact hour of state-commissioned adult vocational training", set forth the principles for commissioning adult vocational training in the framework of SCE.

ANNEX 5. **Private training providers and non-profit associations included in the survey on provision of training in the field of construction**

Company or institution, contact person

1. Bi-Info AS
2. Ehitajate Koolituskeskus, Oleg Kuzin
3. E-Katedraal Koolituskeskus OÜ, Meelis Rattas
4. Erlex Õppekeskus
5. Gelmett Consult OÜ, Andrei Štukatrov, director
6. Juunika Koolitus, Terje Sellik, training manager
7. Kariner OÜ
8. Addenda OÜ, Virve Roosimägi
9. Ehituskeskus, Enn Tammaru
10. Koolituskeskus Punane Puu, Tuulikki Laesson
11. ZWCAD Koolitus OÜ
12. ArenguLine OÜ
13. Kinnisvarakool OÜ, Tõnu Toompark
14. MTÜ Eesti Pottsepad/Kütte ja ventilatsiooni teabekeskus, Ester Tani
15. Auditron
16. Teede Tehnokeskus, Eva Äkke
17. Tehnokontrollikeskus, Imbi Kulp
18. MTÜ Vanamaja
19. Äripäeva Koolituskeskus, Elina Siilbek
20. Tartu Teaduspark, Neeme Kärbo

Professional associations in the construction field included in the survey

1. Estonian Association of Construction Entrepreneurs
2. Estonian Association of Engineers
3. Estonian Association of Heating and Ventilation Engineers

Of the listed companies and organizations, 14 took part in the survey. The respondents represented companies and associations with significant training volumes. Of those that did not respond, two companies had been dissolved and a number did not fill in the questionnaire saying that the construction field accounted for too small a role in their activities.